OP 210-2 Thermal Printer

Optima Printsystems AG

- User Manual and System Documentation -

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OP 210-2 Thermal Printer

User Manual Version 1.3

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1. A few words in advance ...

Thank you for having chosen the high-quality OP 210-2 printer by Optima Printsystems AG. You have purchased a versatile thermal printer with many special features that are explained in this manual.

1.1. ... about this manual

Every effort has been made to ensure that the information contained in this user manual is accurate. It includes all you need to know in relation to the installation and operation of the printer. The introduction gives you a brief overview of the basic principles of thermal printing, making it easier to understand the detailed instructions for your device.

Depending on whether you are already familiar with this product, we recommend that you proceed as follows:

- If you are not familiar with thermal printers, please read chapters 1 to 4 in full. This way, you will be introduced to the printing technology and will learn all you need to know to install and run your printer. You will also find out what to do in the event of minor problems.
- If you have previously used a similar product and only wish to read about certain features, refer to the contents and the index to find the relevant chapters.
- The appendix provides you with technical information in relation to the configuration and technical administration of the printer.

For details on our after-sales service and warranty, please refer to appendix A.1.

Prior to installing the printer, and even if you are in general familiar with thermal printers, we recommend that you read the important chapters on installation, the safety instructions and the specification of consumables.

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Text formats in this manual

1. Important information is printed in *italics*.

   Example: The settings for this special printing mode ...

2. Warnings and notes in relation to safety are printed in ***bold italics***.

   Example: Prior to opening the cover, always ...

3. Entries in the command line mode of the operating system are in Courier.

   ```
   Example: C:\> type c:\test.txt > LPT1:
   ```

4. In this manual, Optima Printsystems AG is referred to as OPTIMA in small caps.
5. The following symbols are used to highlight information of a specific nature:

- **Note**

Important additional information within a comprehensive description or explanation.

- **Please write down**

  Please write down any details given beside this symbol as they might be of use at a later stage when you do not have access to the manual.

- **Caution**

  This symbol highlights instructions where special safety precautions are to be taken. Please proceed therefore with special care.

1.2. ... about online documentation – always up to date

Today, printed documents have a short life-span, as the technical development progresses at a fast pace. This obviously also applies to this manual. We therefore provide you with updated product information and details on changes to the firmware and software on the World Wide Web.

You will find us at

http://www.optima-printer.com

or

http://www.optima-printer.de

This well-designed site provides you with easy access to all relevant information and includes download areas for updates of

- Firmware
- Control software
- Drivers

For technical support, please contact us at

technik@optima-printer.com

If you have queries in relation to sales and services, please send an E-mail to

contact@optima-printer.com

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1.3. ... about thermal printing

Thermal printing uses heat to fix the printed image onto specially treated paper. Electrical energy is thereby converted into heat (temperature of approx. 160 °C) in the printer head. The heat melts the dye couplers in the special paper, resulting in a chemical process involving the colour developers also contained in the paper. The respective sections of the paper are thereby black in colour (see figure 1).

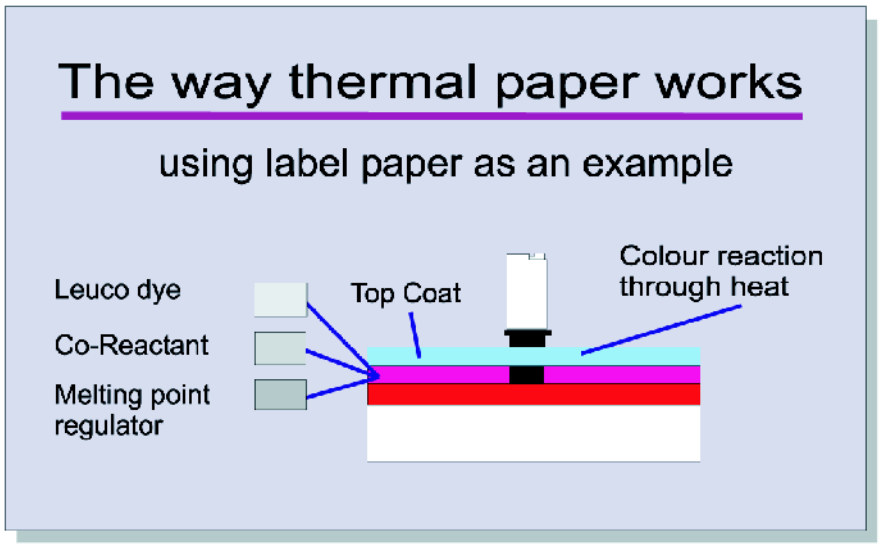

Fig. 1: Principle of thermal paper

The formulation of the coating applied onto the paper determines the print quality, print speed and the energy level necessary for printing. Although thermal paper is specially treated, it is fully recyclable.

Depending on the application, thermal paper of various grammage is needed. OPTIMA recommends that you use only approved paper products with a grammage of approx. 80g/m^2 for high-performance printing.

The principle of thermal printing

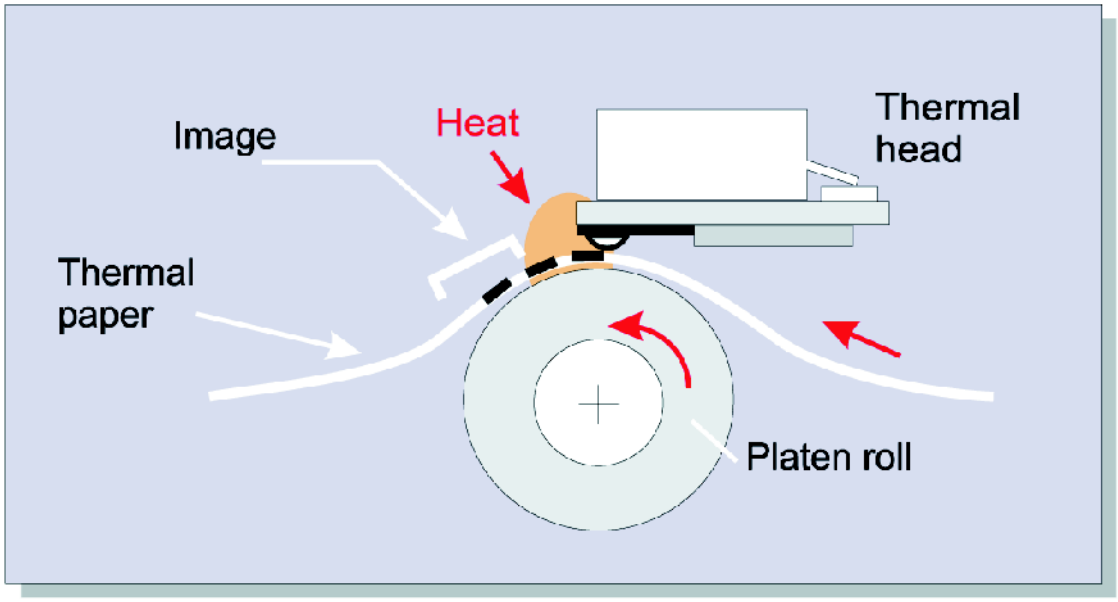

Fig. 2: Principle of thermal printing

As shown in figure 2, the thermal paper is reeled off the roll (arrow pointing to left) and fed between the platen roll (feed roll) and the thermal head, where a colour reaction is induced by electronically controlled heat emitted by the thermal head (see also figure 1). There is no need for further processing and no by-products are produced. Thermal printing is thus a most flexible and efficient printing method, and thermal printers are known for their reliability.

1.4. ... about this product

The OP 210-2 printer is a compact high-tech thermal printer designed for the printing of messages and logs onto continuous-form paper. The integrated high-precision cutting unit allows for unsupervised printing. Due to its compact design, high performance and outstanding flexibility, the thermal printer is suitable for a wide range of applications. Thanks to its very low noise level, versatile manual control features and user-friendly software control, the printer is also suitable as a desktop printer to be operated at a workstation.

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Fig. 3: OP 210-2 thermal printer

The following main features will be explained in more detail in the following chapters:

- Versatile hardware and software interfaces
- Robust, low-maintenance industrial design guaranteeing long service life
- No need for consumables other than thermal paper
- Excellent warranty concept

Thermal printing has several advantages over other printing methods:

- **Fast printing**

  Thermal printers are able to print at speeds between 10 and 300mm/s, irrespective of the width of the paper. Wide paper formats can thus be printed at the same rate as small tickets and there is no delay between the print command and the output.

- **Low noise level**

  As the printing is not by mechanical impact, printing is virtually noiseless.

- **Low energy consumption**

  The printer consumes relatively little energy. Today, there are even portable thermal printers available, e.g. for conductors in trains who print out tickets on the spot.

- **Virtually maintenance-free**

  Thermal printing is virtually wear-free, and thermal printers therefore need very little maintenance, further reducing the operating costs.

- **User-friendly operation**

  All you have to do is from time to time to replace the paper roll. There are no other consumables.

Applications for thermal printers

Thermal printing offers many advantages – and therefore, the technology is constantly updated to make it suitable for a wider range of applications. Over the last few years only, a range of new options have become available and this trend will continue in the near future.

A few examples:

- **Labels**

  Self-adhesive labels, e.g. at weighing scales in supermarkets, in industrial warehouses, for barcode systems, for automatic product labelling, as baggage tags at airports, etc.

- **Tickets of all kinds**

  Admission tickets, flight tickets, horse race slips, etc.

- **Lottery**

  More and more lotteries use online systems where the customer receives a receipt produced by a thermal printer.

- **Parking tickets**

  Parking tickets can be retrieved from solar-powered thermal printing systems.

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- **Bank statements**

  Thermal printers are used in banks to produce statements and receipts at the counter.

- **Tickers**

  News agencies use thermal printers for incoming messages; thermal printers are also widely applied in connection with logistics and planning systems where time is of the essence.

2. Installation

This chapter explains in detail all the necessary steps for the installation and connection of your printer.

For information on consumables, please refer to chapter 3.3. and appendix A.2.5.

2.1. Disclaimer

Every effort has been made to ensure that all the information contained in this manual is accurate, complete and up to date. Subject to applicable law, Optima Printsystems AG shall not be held liable for any direct or indirect damages that result from the use of this manual and the printer. Liability on the part of Optima Printsystems AG is limited to claims for damages due to malice or gross negligence.

Software and devices referred to in this manual and produced by manufacturers other than Optima Printsystems AG might be modified from time to time, and such changes might affect the usability of this manual.

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!

Important safety instructions

Your printer has been developed and produced with the greatest care, to ensure that our customers enjoy many years of safe and reliable use. As the printer is an electrically powered device, there are a few general safety precautions that you should always be aware of. These instructions are provided for your own safety and the protection of your printer against any inadvertent damage. Please read this manual carefully and keep it available for future reference, Read all warnings and safety instructions in this manual and on the device prior to installing the printer. Important warnings are highlighted in this manual with special symbols (see chapter 1.1.).

2.2. Unpacking and connecting the printer

The following items that are included in the delivery are required to install and connect the printer:

- Printer
- Power cable
- Interface cable (parallel)
- Printer driver (on CD)
- Thermal paper

☛

Place the printer onto a level and clean surface of minimum 0.35 m x 0.35 m. Ensure that the paper output is not obstructed.

2.2.1. Unpacking

The printer is delivered in a cardboard box that allows for easy unpacking.

1. Open box
2. Remove padding material

3. Remove printer and accessories from the box
4. Place printer on a suitable surface (see chapter 2.2.3.)

The following accessories are supplied with your printer:

- 1 roll of thermal paper in the printer
- 1 power cable
- 1 cable for parallel communication
- 1 CD containing the driver software and the documentation below the printer

The following optional accessories might be included in your delivery:

- 1 cable for serial communication
- 1 out-tray

The manual is available in PDF format on the CD and is filed in the following directory:

<CD-ROM-Drive>:\doc\pdf\user_manual_eng.pdf

2.2.2. Main printer components

The following figures show the main printer components and provide you with an overview of the rear panel connections and the operating devices.

These illustrations are used as references in the later chapters of this manual.

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External elements

The following figure shows the main external components of the OP 210-2:

- Top cover
- Front cover
- Function buttons

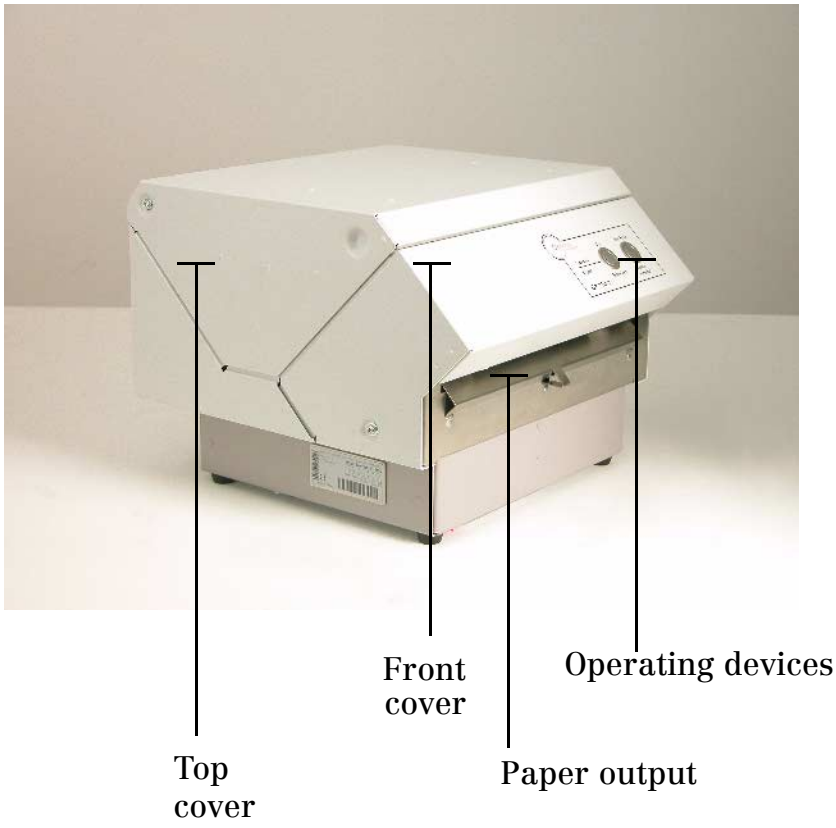

Fig. 4: Printer - external components

Operating devices

The printer is equipped with the following operating elements: LED and two buttons:

- Cut button
- LineFeed button

These elements are shown in more detail in the next figure.

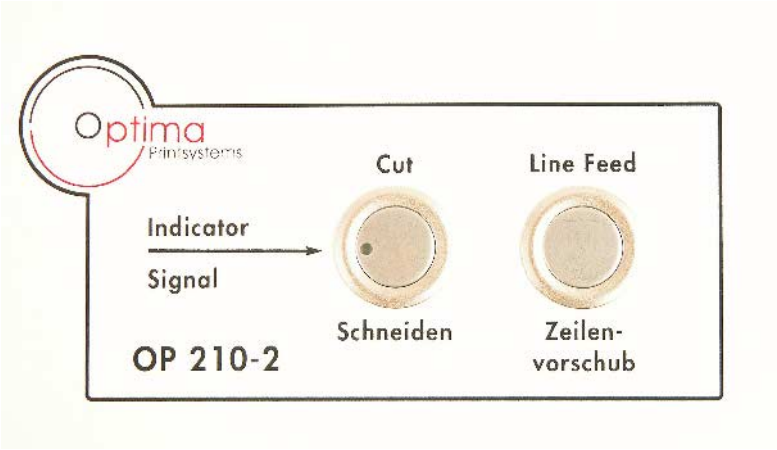

Fig. 5: Operating elements

Ports

All ports at the printer and the power switch are located at the rear of the device.

These ports are shown in more detail in the next figure:

- Power connector
- Parallel port
- Serial port

and

- Power switch

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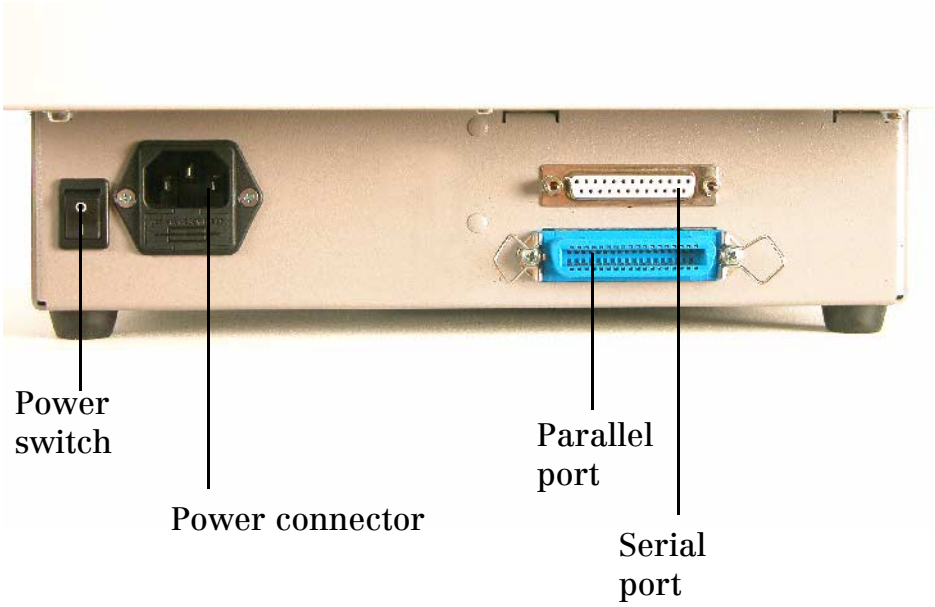

Fig. 6: Printer ports

Important special features

☛ *Paper width*

Thermal paper rolls with a width of 210 mm (standard, corresponds to factory settings) or 216 mm can be used.

Open the printer. Near the base of the rear panel, and near the top front, there are two guide plates each. The guides at the right front and rear bottom corner are fixed.

To change to a different paper width, loosen the screws at the left guides. The left guides have two grooves. Secure guides to the groove to the right for paper with a width of 210 mm.

For paper with a width of 216 mm, align the left guides to the grooves to the left.

2.2.3. Location for printer

After you have unpacked your printer and have familiarised yourself with its main features, install the device at a suitable location.

Please ensure that

- ... the printer is placed onto a stable and level surface. Never place the printer directly beside a radiator or heat vent of an air-conditioning system.
- ... the printer is not brought into contact with liquids of any kind. Therefore never handle liquids in the vicinity of the printer.
- ... no objects are introduced into the printer, as there is a risk of fire or injury to the operator from electric shock.
- ... only routine maintenance as described in this manual is carried out. Don't disassemble the printer, as this could lead to damage to the device or injury by electric shock. Do not make any modifications other than those described in this manual to your printer. The device might otherwise be damaged so that costly repairs might be necessary.

Prior to connecting the printer to your computer, it must be powered.

2.2.4. Power connection

When connecting the printer to the socket, proceed with all necessary care. Always ensure that

- ... the supplied power corresponds to the details on the type plate (located on the left side of the printer). If you are in doubt, please contact your supplier.
- ... the printer is only connected to an earthed power socket. Always use the supplied cable to connect your printer to the socket.

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- ... the load limit of extension cables and multiple adapters is not exceeded.
- ... the power and interface cables are protected against damage. Do not place any object onto the power cable. Ensure that nobody can stand on or trip over the cable.
- ... the serial and parallel cables are not installed or used together at the same time.
- ... damaged power cables are immediately replaced.
- ... the power cable is disconnected from the socket prior to cleaning the exterior of the printer. To clean the printer, use only a dry cloth. Never use liquid or spray cleaners.

For the connection of the printer to the socket, we recommend the following approach:

1. Check the power switch and ensure that it is in position "0". For safety reasons, the printer must remain switched off for all following steps described below.
2. Remove the screws and the shackle for the power cable at the rear of the printer.

3. Plug the power cable first to the printer and then to the power socket.

Connect the printer to the computer by following the instructions in the next chapters.

2.2.5. Connection to parallel port

Always comply with the safety instructions on the first page of this manual. Before you start printing, the printer must be properly connected to the socket. Please follow the instructions in the previous chapter.

To connect your printer to your PC, you have the option of using a parallel or a serial connection. By default, your printer is configured for connection to the parallel port of your computer. This chapter explains in detail how such a connection to the parallel port is to be established.

Caution

Never plug in the parallel and the serial cable at the same time, as this could lead to errors.

!

In chapter 2.2.6., you will find all necessary instructions for connection to a serial port.

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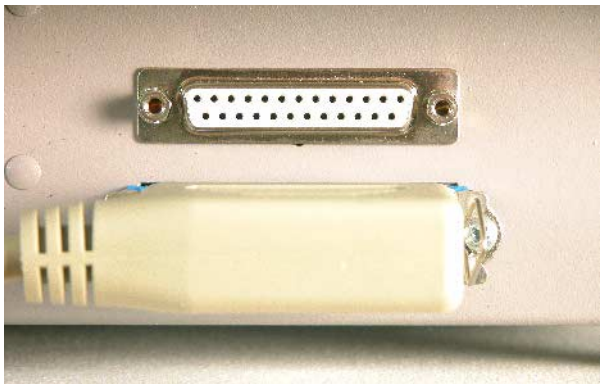
Step-by-step instructions for connection to parallel port

1. Ensure that both the printer and the computer are switched off.
2. Insert the printer plug of the cable into the socket at the rear of the printer.



3. Connect the other adapter of the cable to the respective port on your PC. For instructions, please refer to the PC manual.
4. Switch on the printer and then the computer.

When the printer is switched on, an automatic printer system check is carried out. If no paper has been loaded, the LED flashes. For instructions on how to load paper, please refer to chapter 2.2.7.

2.2.6. Connection to serial port

To connect your printer to your PC, you have the option of using a parallel or a serial connection. By default, your printer is configured for connection to the parallel port of your computer. This chapter explains in detail how to proceed if you wish to connect the printer to a serial port at your computer.

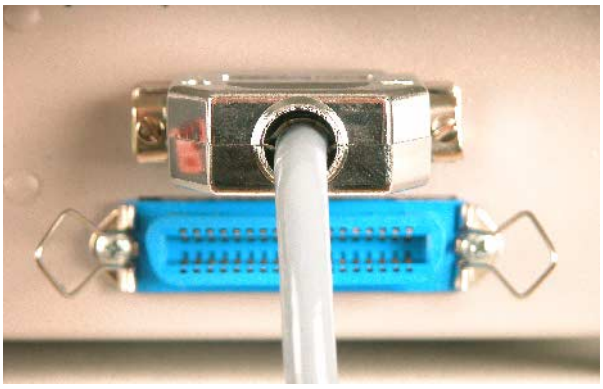
Caution

!

Never plug in the parallel and the serial cable at the same time, as this could lead to errors.

Step-by-step instructions for connection to serial port

1. Ensure that both the printer and the computer are switched off.
2. Connect the printer plug of the cable into the socket at the rear of the printer.



3. Connect the other end of the cable to the respective port on your PC. For instructions, please refer to the PC manual.
4. Switch on your printer and then the computer.

When the printer is switched on, an automatic printer system check is carried out. If no paper has been loaded, the LED flashes. For instructions on how to load paper, please refer to chapter 2.2.7.

2.2.7. Loading paper

To load paper, proceed as follows:

1. Open the top cover of the printer.
2. Rotate the paper roll until the edge of the paper is visible.

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3. Carefully lift the edge of the paper from the roll and remove the first layer.

4. Pull out approximately 10 to 15 cm of paper and insert the edge into the paper feed until the printer begins to pull in the paper. Ensure that the paper is pulled in straight and fully aligned to the guides.

Fig. 7: Loading paper

5. The printer cuts off the edge of the paper. Remove the cut-off section.
6. If the cut is not completed automatically, press the Cut button.
7. Close the top cover.

The LED should now be continuously on, indicating that the printer is ready for operation (standard mode).

All settings identified as "default" settings in chapter A.5.2. of the appendix apply.

Proceed by carrying out an offline test to check the main functions of the printer. For detailed instructions, please refer to chapter 2.5.1.

2.2.8. Switching printer to serial port

To configure your printer for operation via serial port, you have the option to connect it to the PC using the parallel connection and start the configuration software to change the settings where appropriate.

The options provided by the configuration software and detailed instructions on its use are included in chapter A.4. in the appendix.

2.2.9. Manual change of printer interface

If your printer is currently connected via serial interface to the PC and you wish to change to connection via parallel interface, you must manually change certain settings in the printer's control menu.

The following chapter describes the steps necessary to enable the parallel interface.

1. Switch off the printer.
2. Switch printer on again, while pressing the Cut button. The printer is now in configuration mode.

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3. The printer automatically initiates a menu showing the following specifications:

   Firmware version (e.g. 013.01.002.001T34)

   Bootloader version (e.g. 013.02.002.001B10)

   Serial number of printer (e.g. 0007654321)

   In addition to this information, the menu initially provides you with the option to choose between a German or an English user interface. To make your selection, press the respective buttons (Cut or LineFeed).

4. After you have chosen the language, the above specifications are printed again and the currently activated interface is shown (menu 14).

5. Press the LineFeed button to change the configuration. The printer produces a printout, showing the new settings. You have the option to choose between the following configurations:

   - Serial communication
   - Uni-directional parallel communication
   - Bidirectional parallel communication

6. To confirm that you wish to change to the displayed interface, press the Cut button. To change to another interface, press the LineFeed button.

7. Subsequently press the Cut button and hold it for approximately 2 to 5 seconds. The new settings are printed out. To accept these settings, press the Cut button. To reject them, press the LineFeed button. Please confirm your selection. The printer cuts the previous printouts and returns to standard mode.

   Caution

   If, in configuration mode, no button is pressed for more than 60 seconds, all changes are rejected and the printer automatically returns to standard mode.

2.3. Software

The driver and documentation CD contains both the printer driver and a utility for the configuration and control of the printer.

2.4. Printer driver

Currently, we provide graphic drivers for the following operating systems:

- Windows® 95/98
- Windows® NT4.0

Graphic driver installation

!

This chapter contains general instructions for the installation of a printer driver. The actual steps might vary between the different operating systems. Please always read the instructions of your operating system for the installation of printer drivers.

1. Connect your printer to the PC as described in chapter 2.2.
2. Switch on your PC and the printer and insert the CD by OPTIMA. Note the drive letter of your CD-ROM drive. (The Drive letter depends on your actual system configuration. In these instructions, we refer to the CD-ROM drive as drive "E:").
3. Click "Start" > "Settings"
   -> "Printers" to access the printer overview window.
4. Double-click "Add printer" and start the "Add Printer Wizard". Continue by clicking "Next".
5. Select "Local printer" and confirm with "Next".
6. The next window lists all printer drivers known to your system. Click the "Have Disk ..." button.

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7. In the "Install from Disk" dialog, enter the following path:

   `E:\driver\winnt\oemsetup.inf` (Windows®NT 4)

   or

   `E:\driver\win95_98\oemsetup.inf` (Windows® 95/98)

   Confirm by clicking "OK".
8. In the next dialog, click the listed printer and click "Next". The printer driver is now being installed.
9. Select the printer port:

   `LPT1:` for connection to the parallel port

   or `COM1:` or `COM2:` for connection to the serial port.

   Continue by clicking "Next".
10. Select "Default printer for Windows programmes" and confirm with "Next".
11. The settings regarding the sharing of the printer within your Windows network depend on the actual network configuration. Please consult your system administrator.
12. Print out a test page. If the test page is printed correctly, click "Yes". The printer and the necessary software are now installed.

    If you encounter any problems, please refer to chapter 4. and consult your system administrator.

2.4.1. Configuration software

The configuration software provides you with a wide range of options to configure and manage your printer. The programme runs in MS-DOS® and is menu-driven so that you will have no difficulties to use it without mouse support.

The technical details of the menu control and the programme options are described in detail in appendix A.4.

The configuration software can be used directly from the supplied bootable CD or from a boot floppy.

If the printer is to be connected to a system that does not support MS-DOS® (e.g. Unix system), the printer must be temporarily connected to a PC for configuration.

Configuration with bootable CD

Prior to installing or using the configuration software, and if your printer is connected to the parallel port of the PC, check the BIOS settings for this port. If in doubt, consult your PC manual. The parallel port settings must read:

EPP or standard bidirectional communication

1. Insert the OPTIMA CD into the CD-ROM drive of your computer and restart the PC.
2. If the CD-ROM drive is bootable and if your PC supports MS-DOS, the following menu is displayed after a few seconds.

   A - Abort (default settings: the startup process is automatically aborted, if no entry is made within 60 seconds.)

   B - Konfigurations-Software (German)

   C - Configuration Software (English)
3. Press "C" to start the English version of the configuration utility.

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4. For all menu items and settings, there is context-sensitive help available, which covers all issues in detail. To access the help, press "F1". For further information, please refer to appendix A.4.

   If the above programme is not displayed, or the PC cannot be booted as described above when the CD is inserted, please create a bootable floppy disk as described below, insert it into the drive and restart your system.

   After your PC is restarted, the above boot menu is displayed and the configuration software can be run.

Creating a bootable floppy disk

1. Start your computer and insert the OPTIMA CD into the drive. Open the file manager or Windows® Explorer and select the following directory on the CD-ROM:

   `E:\tools`

2. This directory contains the file `bootdisc.exe`. Start this executable file by double-clicking it and then select the English version of the configuration software.
3. You are prompted to insert a floppy disk. Please ensure that the floppy is not write-protected.
4. The floppy disk is now formatted, if necessary, and the required files are copied.
5. After successful completion, you can immediately restart your PC while the floppy is in the drive. The configuration software is now available. This floppy disk can be used at any time as a bootable disk to start your system.

2.5. Function tests

There are various options available to test the printer functions and the communication between PC and printer.

- The offline test allows you to check whether the printer itself is working properly, irrespective of the PC. It can be completed with or without a connection of the printer to the PC.

- The online tests can be used to check the printer functions and the communication between the printer and the computer. There are also tests available to establish whether the printer driver has been correctly installed and is working properly.

2.5.1. Offline test

To check the printer functions, carry out a self-test.

The test allows you to check the printing quality and to ensure that the paper feed and the cutting system are working properly. If there are difficulties with the paper feed and output, the print might also be affected.

This test is carried out independently of the interface to the PC and concerns the principle functions of the printer. To start the test, proceed as follows:

1. Switch off the printer.
2. Switch printer on again, while pressing the LineFeed button. After switching on the printer, keep the button pressed for approximately 5 seconds.
3. The printer prints the standard „Dr. Grauert letter“ and cuts it.

After cutting, the printer is automatically reset to standard mode and the test is completed.

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2.5.2. Online tests

Test with Windows® printer drivers

This test allows you to check whether the printer driver has been correctly installed and is working properly, and whether the PC and the printer are properly connected. The test is integrated into the properties of the installed printer. To start the test, proceed as follows:

1. Select "Start" -> "Settings" -> "Printers".
2. Select the OP 210-2 printer driver. Click the right mouse button and select "Properties".
3. In the dialog, click the "Print Test Page" button.
4. If a test page is printed, the devices and software components are working properly.

If you encounter any difficulties, contact your system administrator and refer to the instructions for troubleshooting in chapter 4.

Testing the printer by analysing a HEX DUMP

To analyse the data sent from the PC to the printer, you have the option to view the hexadecimal output. All data sent to the printer, including text and printing commands, are printed in both hexadecimal and ASCII format (in ASCII format, all non-printable codes are shown as dots).

To activate this mode, switch on the printer while pressing the LineFeed and the Cut button.

Caution: Ensure that paper has been loaded.

Example of test result

The BASIC line:

```
10 LPRINT CHR$(27);"0";CHR$(30); This is an
example of a hexadecimal dump."
```

is for example printed as follows:

```
Hex Data Dump

1B 30 1E 54 68 69 73 20 69 73 20 61 6E 20 65 78     .0.This is an ex
61 6D 70 6C 65 20 6F 66 20 61 20 68 65 78 61 64     ample of a hexad
65 63 69 6D 61 6C 20 64 75 6D 70 2E 0D 0A           ecimal dump! ....
```

To return to standard printing mode, switch the printer off and on again.

Printing from MS-DOS®

For instructions on how to test the online function in MS-DOS®, please refer to chapters 3.2.2. and 3.2.3.

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3. Printing

This chapter contains all the information needed for the daily running of the printer, including detailed instructions on:

- Operating elements
- Printer settings
- Consumables
- Cleaning and maintenance

3.1. Operating panel and buttons

The display and operating devices for the operation of the printer are integrated into the housing. In addition to the properties described here, please also refer to the information on the identification of errors in chapter 4.

3.1.1. Operating panel

The operating panel includes buttons for the control of certain printing and cutting functions. By means of the operating panel, you have the option to directly select the basic functions for the printing. The LED indicates the current operating mode of the printer.

3.1.2. Buttons

The functions of the buttons depend on the operating mode of the printer. If the printer is in ready mode, the functions indicted above the buttons apply. This mode is automatically activated when the printer is switched on. In this mode, the LED is on.

The LED generally indicates the operating mode of the printer (ready/not ready).

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To advance the paper by one line, press the LineFeed button. For continuous pressing, the paper is advanced (form-feed) and cut.

For manual cutting the paper at the tear position, press the Cut button. This function (Tear-ON) is only available, if it has been previously enabled in the menu (see menu settings in appendix A.5.2.).

If this function is not enabled (Tear-OFF), paper can be manually cut by pressing and holding down the LineFeed button.

When the cover is open, press the Cut button to transport paper in reverse direction, e.g. to remove paper in order to replace the roll.

3.2. Print control

To ensure that the printer can be used in conjunction with as many applications as possible, it is equipped with an Emulation. Emulation basically describes the ability of mimicking the functions of a specific device. This means that emulation enables your printer to execute the commands and functions of a printer that is predefined in an application.

Most emulations also come with additional functions that exceed those of the emulated device, thus providing special printing options for your modern thermal printer.

3.2.1. Printer driver

In order to write application programmes that are not linked to a specific output device such as a monitor or a printer, they generally come with drivers, which basically consist of exchangeable programme sections for the output of data. The driver receives output commands from the actual application. These commands are of a general nature and are subsequently converted into specific commands and functions for the respective printer.

When installing and/or modifying printer drivers, you should always consult the manual of the relevant application, as features might vary between different software and language versions of the program. The instructions below might therefore not apply to your specific programme.

3.2.2. Printing in DOS® via parallel interface

Although DOS®, in contrast to word processing or graphic design programmes, does not include functions for printing, it is possible to print out ASCII or print files in DOS®. The following examples apply to systems where the printer is connected to the parallel LPT1: port of the PC. If the printer is connected to another interface, (e.g. LPT2:, LPT3:, COM1:, COM2:), the address in the following examples must be changed accordingly. For more information on serial interfaces, please refer to the next chapter.

TYPE — With the TYPE command and routing to device LPT1: it is possible to print ASCII or print files.

```
TYPE C:\Autoexec.BAT > LPT1:
TYPE C:\Letters\Letter.TXT > LPT1:
```

In the first example, the AUTOEXEC.BAT file in the root directory is printed, while the second example prints file Letter.TXT located in the Letters directory.

COPY — With the COPY command, files can be copied from one storage device (floppy disk, hard disk) to another. With COPY, you can also transfer printable files to the printer. When using the COPY command, we recommend activating option /B in order to ensure that also binary and graphic files can be copied without restrictions.

```
COPY /B C:\Autoexec.BAT > LPT1:
COPY /B C:\Letters\Letter.TXT > LPT1:
```

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The COPY command also allows for the copying of keystrokes to the printer.

```
COPY  CON:  LPT1
This is a short test
Ctrl-Z (or F6)
```

CTRL-P — After keystroke CTRL-P (press CTRL key and the press P), the text shown on the monitor is also output to the current printer unit and logged. If, for instance, the DIR command is keyed in, the current directory (file names) is not only shown on the monitor but also output to the printer. By means of the key combination CTRL-P, the logging of the monitor data on the printer is again deactivated.

3.2.3. Printing in DOS® via serial interface (RS-232C)

When printing from DOS through a serial interface, please note that only the READY / BUSY protocol (hardware handshake) is supported. Printing with XON / XOFF (software handshake) is however possible by means of a data communication software such as Telix, Procom. Such EDI programmes are suitable for the testing of interfaces, as they allow for simple modifications of parameters.

Please also note that

- the settings for the serial interface of the printer must correspond to the settings of the serial port of the PC.
- the interface cable must be wired to suit the actual settings (see also appendix A.3.2.).

The settings of the serial interface at the computer side can be defined by means of the MODE command as follows:

```
MODE COM1: 9600,n,8,1,p
```

For more detailed instructions regarding the MODE command, please refer to the manual of your operating systems (e.g. Windows® 98).

Chapter A.3. (Hardware interfaces) contains more information in relation to wiring, pin assignment, etc. in connection with the serial interface.

3.3. Consumables

To ensure error-free printing and best output quality, we strongly recommend the use of thermal paper approved by OPTIMA. We shall not be liable for damages resulting from the use of consumables that are not approved by OPTIMA, and which would not have occurred if approved consumables had been used.

Approved thermal paper is available directly from OPTIMA. Please contact OPTIMA for detailed specifications of suitable products and a supplier list for approved papers.

All servicing that exceeds the routine maintenance tasks and cleaning described in this manual should only be carried out by OPTIMA. We shall not be liable for damages caused by unauthorised servicing or improper maintenance.

Selecting suitable printing paper

1. Use only thermal paper approved by OPTIMA. Such paper products carry the OPTIMA approval mark.
2. When purchasing thermal paper, look for paper with the OPTIMA approval mark. All special papers have been extensively tested by the printer manufacturer. Only products that have been approved guarantee disruption-free printing and a long service life of your equipment.

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!

3. If thermal paper without the approval mark is used in the OP 210-2,the printer could be seriously damaged, whereby such damages are not covered by our warranty.
4. Never use paper rolls that are damaged, as this could lead to a paper jam.
5. Store paper rolls in the original packaging in a dry and cool location in an upright position.

3.4. Cleaning and maintenance

The printer is specifically designed to require minimum maintenance and cleaning.

To ensure disruption-free printing, we recommend that you clean your printer every six months (or after 300 hours of operation).

Cleaning instructions:

!

Caution

Prior to cleaning your printer, disconnect it from the socket and the PC by removing the power and the interface and network cables.

1. Open the top cover and remove the paper roll.
2. Remove all paper residue and dust by brushing out the interior of the printer with a soft brush.

3. Unlock and open the print engine and clean the area around it. Near the thermal line, clean surfaces only with a soft cloth or brush as the device could otherwise be damaged.

Fig. 8: Opening/closing of print engine

4. Do not lubricate the internal printer components.
5. Do not use any solvents or detergents to clean the printer housing.

3.5. Packaging for shipping

To transport your printer (shipment, relocation of office, repairs), please comply with the packaging instructions below to protect your printer.

!

If your printer is not properly packed for transport, it might be damaged. Any warranty is voided if the thermal printer is not packed for transport as described here. All costs for cleaning and repairs are payable by the owner of the device. Always pack the printer in the original packaging material.

1. Switch off the printer. Disconnect all cables at the rear.

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2. Remove the paper roll.
3. Pack the printer in the supplied plastic bag. Secure the printer in the box with the foam inserts.
4. Seal the cardboard box with tape.

!

Insurance companies and hauliers reject any claims for damages caused to equipment that has not been properly packed.

4. Troubleshooting

The instructions in this chapter allow you to identify and eliminate minor problems with your printer and gives instructions on how to proceed in the event of more serious problems that require servicing and/or repair by specialists.

4.1. General instructions

Before you send your device back to base for repair, please consider the following:

- We recommend that you read this chapter carefully prior to contacting OPTIMA.
- Even if your device is covered by warranty, you might be charged by the after-sales services for costs in relation to servicing that you could have carried out yourself, according to the instructions in this chapter.
- Insurance companies and hauliers reject any claims for damages caused to equipment that has not been properly packed.

4.2. Common disruptions and error messages

Most disruptions can easily be eliminated by the user. Prior to calling our customer service, consult the following checklist and try to eliminate the error by following the relevant instructions. Minor problems can generally be eliminated without any difficulties.

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4.2.1. Error descriptions

If the printer encounters any difficulties during operation, the user is generally alerted by the flashing LED.

This is always the case in the event of errors, with the exception of errors that result in a complete failure of the printer.

The flashing of the LED indicates the nature of the error. To identify the error, proceed as follows:

Note the error code on the basis of the LED signals. The LED is switched off for one second and the begins to flash at the following intervals:
0.2 seconds on - 0.5 seconds off. The code corresponds to the number of on/offs of the LED.

Error signals

Example: The LED is off for 1 second (start to count now).

The LED is flashing 4 times: 0.2 seconds on and 0.5 seconds off
= "4" = error code

According to table 1, this error code indicates that the housing cover of the printer is open.

Code	Description	Elimination by
1	Paper jam	User
2	End of paper roll	User
3	Print engine open	User
4	Housing cover open	User
7	Ticket too long	User
9	Error in cutting unit	User
10	Power supply error	Service
11	Paper feed error	User
15	Memory error	Service

Table 1: Error codes

!

Caution

If the LED is flashing at short intervals (on for 30 ms, off for irregular periods), this is known as a flash alert. It indicates that your printer firmware is not ready for operation. Contact your supplier.

4.2.2. Solving minor problems

This overview contains a description of how an error manifests itself and how it can be eliminated. Firstly, establish where the error is caused and then follow the instructions to solve the problem. If an error cannot be eliminated, contact your supplier.

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What should I do ...

... if nothing happens after I have switched on the printer?

The printer might not be connected to the socket. Check the power cable and ensure that it is plugged in at both the printer and the earthed power socket.

... if the printer fails to print although data has been sent to it from the PC?

Check whether your printer is in OFF LINE mode. If the LED is not continuously on, check whether the communication cable between the printer and the PC is connected to the correct ports at both ends.

... if the paper is jammed?

Paper jams should only occur very rarely. However, if the paper is jammed, check whether the paper has been pulled along the guide rail into the automatic feed mechanism.

If the paper is jammed, please proceed as follows:

1. Switch off the printer.
2. Open the top cover and then the front cover of the housing.

3. Open the locking mechanism to the right and the left of the print engine cover.

Fig. 9: Unlocking print engine

4. Lift the print engine cover to the stop position.

Fig. 10: Removing paper

5. Rotate the paper roll so that the paper is pulled from the print engine. Remove all pieces of paper that might still be in the print engine. Ensure that there are no pieces of paper left in paper run (in front of and behind the rubber roller).
6. Cut the end of the paper roll to obtain a straight edge.

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7. Close and lock the print engine cover.
8. Close the front cover of the printer housing.
9. Switch on the printer.
10. Insert the straight paper edge into the feed mechanism and ensure that the paper is properly pulled in. After the paper has been fed through the print engine, it is cut (see also chapter 2.2.7.).
11. Close the top cover of the housing. The printer returns to standard operating mode (LED continuously on).

... if there is no print on the paper, even though it is properly fed through the engine?

Only one side of the paper is equipped with a thermo-sensitive coating. Please ensure that the paper roll has been correctly inserted.

... if printouts produced with a word processing programme are differently formatted than defined in the programmes print menu and settings?

Upon the transfer of print data, many applications send control commands to the printer, which define the printer settings for the subsequently transmitted file. These initiating commands override the basic settings. Consult the manual of the application to find out how this initialisation can be modified and delete all commands that you wish to eliminate.

A. Appendix

The appendix covers all technical aspects of your printer. In order to use this information to modify the configuration of your printer, you should have a good technical understanding of the device. If in doubt, always contact your system administrator or the Optima service desk. Incorrect modification can lead to disruptions in the printing process or damage to your device, whereby such damages are not covered by warranty.

A.1. Warranty and customer service

All warranty and customer services are provided directly by OPTIMA.

For details on how to contact us, please refer to our website at

www.optima-printer.com

or contact us by e-mail to

contact@optima-printer.com

On request, we will send you the General Business Terms and Conditions of Optima Printsystems AG. All statutory regulations governing warranty apply.

For specific arrangements regarding services and warranty, please refer to your purchase contract.

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A.2. Technical parameters

This chapter provides and overview of the main technical features and data, which are described in detail in the subsequent chapters.

A.2.1. Technical data at a glance

Printer model:	OP 210-2
Printing method:	Direct thermal printing
Service life of print head:	minimum 50,000 m (approx. 200,000 DIN A4 pages) †
Line spacing:	1/6 inch, 1/8 inch
Printing speed:	up to 80 mm/second
Service life of cutting unit:	approx. 1 million cuts (paper 80 g/m^2)†
Paper:	Thermal paper
Grammage:	80 – 120 (g/m^2)
Paper widths:	210 / 216 mm
Paper format:	Rolls: diameter 6 inch (152 mm), width 210 mm, core diameter 2 inch
Resolution:	203 x 203 dpi
Output formats:	DIN A4, continuous-form, 3 inch, 4 inch, 5 inch, 6 inch, 7 inch, 8 inch, 9 inch, 10 inch, 11 inch, 12 inch
Autocut® at text end code:	yes
Housing:	Shielded metal housing

†. provided that only materials that fulfil the requirements of the printer manufacturer are used.

Printer driver for graphics printing:	Windows® NT 4.0, Windows® 95, Windows® 98
Printer driver for text printing:	OS/2®, AIX®, MAC OS®, VMS®, etc. (Generic Text Driver)
Emulations:	OP 210-2 (graphics printer) Emulation I - similar to EPSON Emulation II - similar to IBM
Interfaces:	8-bit unidirectional/bidirectional parallel interface and serial interface (RS-232C/V.24)
Noise:	~ 48 dB(A)
Supply voltage:	100 - 240 V AC, 50-60 Hz (Option: 24V DC)
Power consumption:	Printing ~ 50 to 80 W / Stand-by ~ 8W
Dimensions:	(LxWxH) 330 x 310 x 235
Approvals:	CE and (UL&EN 60950 in preparation)
Weight:	approx. 16 kg
System compatibility:	> 6 years

Subject to technical changes without prior notice.

A.2.2. Detailed description of technical features

Design

The printer has been designed as a compact desktop printer and consists of the following main components:

- Thermal printing module for output rates up to 80 mm/ second at 203 dpi. Printing widths 210mm (DIN-A4) and 216 mm (US letter). Printer resolution 203 dpi (optional 300 dpi).

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- Integrated cutting unit.
- Paper roll holder for 6-inch rolls (diameter 152 mm).
- Controller with Centronics parallel interface (unidirectional or bidirectional), serial interface (RS-232C/V.24).
- Loadable firmware (flash PROM).
- I/O for page memory, 1 Mb at 203 dpi, 3 Mb at 300 dpi.
- Integrated power supply
  100 V AC to 240 V AC, 50 – 60 Hz, 150W.
- Housing containing all above components and one 6-inch paper roll (diameter 152 mm).

General features

The printer is designed for direct thermal printing (resolution of 203 dpi) on continuous-form paper (widths 210 mm and 216 mm) of 80 to 120 g/m^2.

The printer has specifically been developed for use in a modern industrial environment:

- High output rate up to 80 mm/second (approx. 10 pages/ minute)
- No pre-heating
- Full graphics support, seamless printing across the entire printing area
- No need for additional consumables
- Suitable for large paper rolls with a diameter of up to 152 mm (corresponds to approx. 190 m of paper with a grammage of 80 g/m^2)
- Minimum cut paper length of 3 inch, no limit regarding maximum paper length
- Extremely high availability, thanks to industrial design with minimum number of moving parts

- The entire paper run through the printing module is accessible so that errors can be easily eliminated
- The controller is capable of handling software updates; loadable firmware (storage in flash PROM)
- Detailed status and error messages via RS-232C/V.24 interface or bidirectional parallel interface
- Printer drivers for Windows® NT 4.0, Windows® 95 and Windows® 98 – specifically designed for high data throughput rates
- All sensors are adjusted and controlled by an integrated microprocessor, ensuring proper functioning even under adverse conditions

A.2.3. Technical data of the modules and assemblies

Combined printing and cutting unit and paper output sensor

The combined printing and cutting unit is a compact assembly allowing for virtually straight paper feed and controlled paper transfer between the print engine and the cutter. In the event of an error such as a paper jam, the entire paper run can be accessed and easily cleared.

The paper feed of the printing module is equipped with a see-through sensor located at the centre of the feed, indicating when a paper roll is used up. This sensor also monitors the "automatic paper threading".

A second (optional) sensor located in the paper run of the printing module allows for controlling of the format of pre-printed stationary paper: See-through sensor for format control through punch, reflex sensor for black marks.

The load of the thermal line is controlled by means of a temperature sensor located in the line itself, and the history control function. This ensures that the thermal line is operated within the permitted range, even at highest loads (temperature, print volume).

In order to process different paper types, the software allows for the adjustment of the dot performance.

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Printing module

Printing method:	Thermal printing
Print resolution :	203 dpi x 203 dpi
Printing speed:	up to 80 mm/second (depending on paper quality)
Printing width :	216 mm
Paper width	Adjustable: 210 mm or 216 mm
Sensors:	Housing cover *Open / closed* Print engine *Open / closed* End of paper roll *The respective sensor is located at the centre of the paper feed slot and fulfils 2 functions:* *1. Paper end alert* *2. Monitoring of automatic paper threading upon change of paper roll* Format control (optional) *See-through sensor for punched forms, reflex sensor for black marks; the sensor can be continuously adjusted across the entire paper width.*

Cutting unit

Method:	Self-sharpening reel cutter with cutter motor equipped with sensors for left and right initial positions of the blade
Cutting speed:	approx. 600 mm/s
Paper width	210 mm or 216 mm

Control of the photoelectric sensors

All photoelectric sensors for paper detection are readjusted by the printer controller. This ensures that the printer can be used, even if the photoelectric barriers are highly blinded. The degree of the deviation adjustment can be queried via the interface (not available with Centronics unidirectional interface).

Power supply

Power adapter:	Input voltage: 100 V AC - 240 V AC, 50 – 60 Hz Load: 150 W Option: 24 V DC

Hardware controller

Scope:	Control of all functions in connection with paper transport, printing, cutting, output and monitoring of all processes.
Interface:	Centronics parallel interface (unidirectional or bidirectional), RS-232C/V.24
Emulation:	OP 210-2 (special emulation) Emulation I - similar to EPSON Emulation II - similar to IBM
Character sets:	IBM2 character set including national sets
Flash-PROM:	up to 640 Kb for firmware, loadable
RAM:	On-board 512 Kb
Extended memory:	RAM card extendible up to 6 Mb (optional)
EEPROM:	Non-volatile memory of 512 bytes for the storage of interface parameters, the selected current density values for the thermal line, the operating points of the photoelectric barriers, etc.

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Control of thermal line:	Temperature sensor (integrated in line) History control Adjustment of dot performance (by means of control code enabling the adjustment of the thermal line to different paper qualities)
Control of the photoelectric sensors:	All photoelectric sensors that monitor the paper feed are readjusted by the processor

A.2.4. Technical specifications of the printer

Service life

Printer without thermal line:	MTBF: 40,000 hours (duty cycle 15%)
Thermal line:	Pulse load: min. 50 million pulses Wear: min. 50,000 m
Cutting unit:	1 million cuts (80 g/m^2 thermal paper)

!

Caution

The above service life figures for the thermal line and the cutting blade refer to blank paper of a quality approved by the printer manufacturer. For pre-printed stationary, the service life must be individually determined in paper tests.

Power supply

Power adapter:	Input voltage: 100 - 240 V AC, 50 – 60 Hz Load: 150W Option: 24 V DC

Operating conditions

Temperature:	Operation: - 5 to + 30 °C Storage: - 30 to + 70 °C
Humidity:	Operation: 10% to 90% (no condensation) Storage: 10% to 90%
Approvals:	CE Mark Safety certificate according to EN 60950 and UL in preparation

Outside dimensions

Height:	245 mm
Width:	320 mm
Depth:	330 mm

A.2.5. Paper specifications

Paper type:	Thermal-sensitive paper
Paper roll diameter:	Outer diameter: max. 6 inch (152 mm) Core diameter: 2 inch Core wall thickness: min. 4 mm Paper width: 210 mm and 216 mm
Grammage:	80 to 120 g/m^2
Cut paper length:	min. 3 inch max. roll length

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A.3. Hardware interfaces

A.3.1. Parallel interface

The integrated parallel interface can be operated as "8-bit unidirectional interface (compatible with Centronics)" or in bidirectional mode as "8-bit bidirectional parallel interface".

8-bit unidirectional interface (compatible with Centronics)

Specifications

Data frame:	8 bit
Synchronisation:	STROBE pulse (N)
Handshake:	BUSY and ACK signal (N)
Signal level:	TTL compatible
Plug adapter:	36-pin 57-30360 Amphenol plug or similar compatible design

Pin assignment and signals

Pin	Shield-ing	Signal	Direction	Function
1	19	STROBE (N)	to printer	Pulses through this line indicate that data can be read
2	20	DATA 1	to printer	Data bit 0
3	21	DATA 2	to printer	Data bit 1
4	22	DATA 3	to printer	Data bit 2
5	23	DATA 4	to printer	Data bit 3
6	24	DATA 5	to printer	Data bit 4
7	25	DATA 6	to printer	Data bit 5
8	26	DATA 7	to printer	Data bit 6

Table 2: Parallel interface pin assignment

Pin	Shield-ing	Signal	Direction	Function
9	27	DATA 8	to printer	Data bit 7
10	28	ACK (N)	from printer	LOW with a pulse width of approx. 2 µs indicates that data has been received and that the printer is again ready for reception
11	29	BUSY	from printer	At HIGH, the printer is unable to receive data. Signal is set to HIGH in the event of 1) printer buffer is full 2) error message The polarity can be switched in the printer menu.
12	30	PE	from printer	Signal HIGH indicates 1) paper nearly used up 2) end of paper roll (error mode)
13	30	SLCT	from printer	HIGH indicates that the printer is ready for operation.
14	-	AUTO-FD (N)	to printer	no function assigned
15	-	NC	-	not assigned
16	-	NC	-	not assigned
17	-	NC	-	not assigned
18	-	+5 V DC	from printer	+5 V, max. 50 mA
19-30	-	GND	-	Return conductors for twisted-pair wires
31	16	INIT (N)	to printer	Printer is being initialised. The LOW level must be held for more than 0.5 ms.
32	-	FAULT (N)	from printer	Signal is set to LOW in the event of 1) end of paper roll 2) error message
33	-	NC	-	not assigned
34	-	NC	-	not assigned
35	-	NC	-	not assigned
36	-	SLCTIN (N)	-	not supported

Table 2: Parallel interface pin assignment

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Note

In column "Shielding", the pins used as signal grounds are listed. For the wiring of the interfaces, use only twisted-pair cables connected to the respective signal and ground pin.

To prevent interference, use only shielded cables.

Signal levels

LOW level:	0.0V to +0.8V
HIGH level:	+2.4V to +5.0V

8-bit bidirectional parallel interface

Timing of parallel interface

The two figures below show the timing for transmission and reception at the parallel interface.

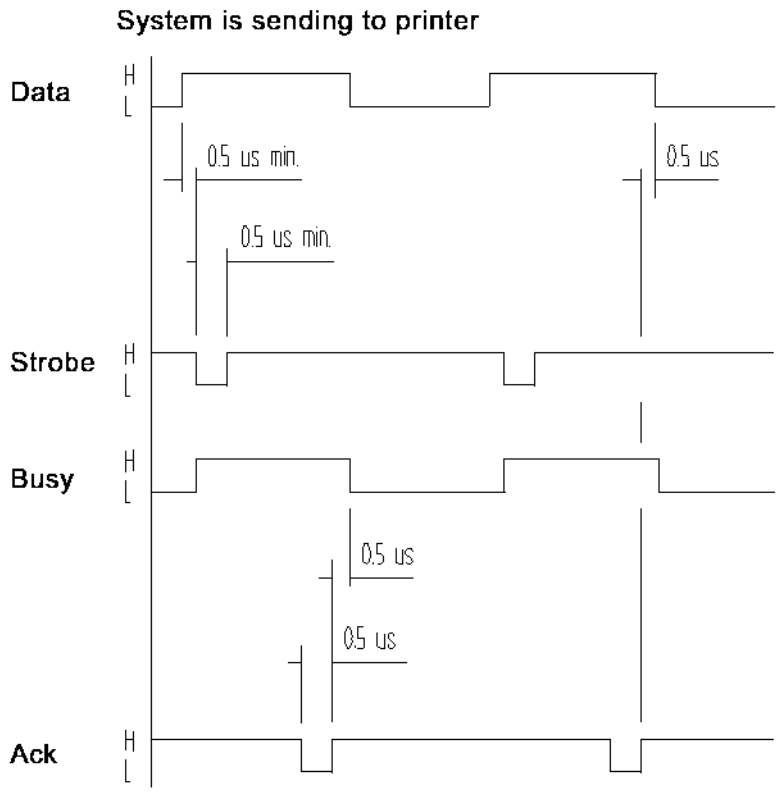

Fig. 11: Reception at parallel interface

The PC sends a data item to the bus and generates a STROBE pulse. This pulse stores the data item in a "latch" and indicates to the printer that a character is available. The hardware activates the BUSY signal. As soon as the printer has fetched the signal from the interface, it issues an ACK pulse and deactivates the BUSY signal to indicate that the interface is again available.

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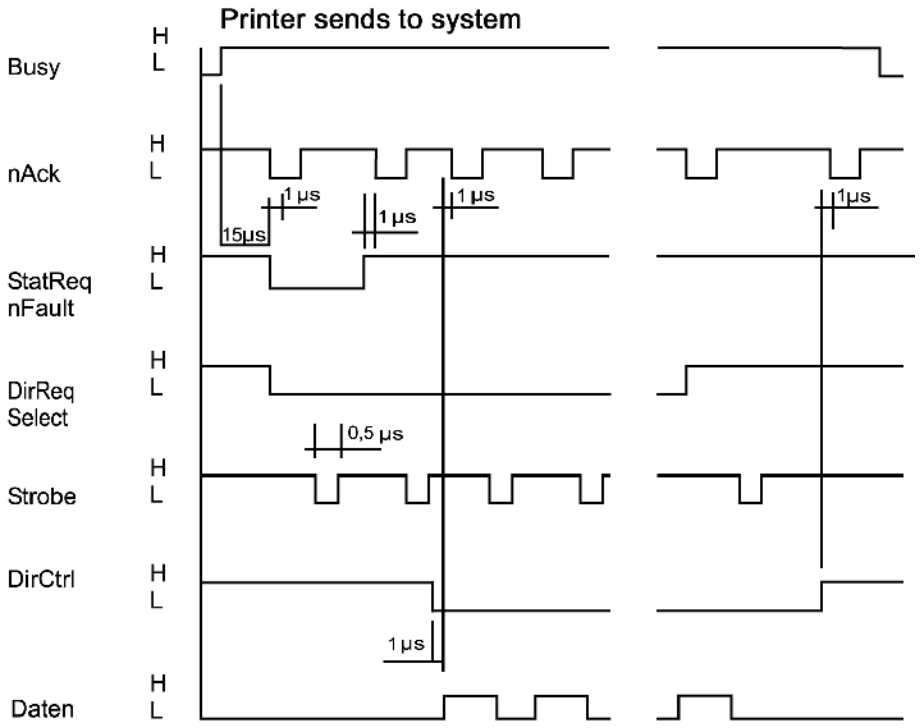

Fig. 12: Transmission (only for bidirectional interface)

If a signal is to be sent from the printer to the computer, the printer initially activates the BUSY signal, followed by a lag time of 15 µs. The interface is thereby blocked. If, during this period, a STROBE pulse is received, the printer processes the signal as if in reception mode. However, the BUSY signal is thereby not deactivated.

After the lapse of the lag time, the printer activates the signals "StatReq" (nFault) and "DirReq" (Select) and sends an ACK pulse. The computer subsequently switches its bus driver to reception mode and replies with a STROBE pulse. The printer responds by deactivating the "StatReq" and the "DirCrtl" signals, switches its bus driver to transmission mode, and confirms this by an ACK pulse. The computer must acknowledge this process by sending a STROBE pulse.

Subsequently, the printer sends the first byte to the bus and sends an ACK pulse. As soon as this byte is fetched by the computer, it sends a STROBE pulse to acknowledge the reception. This procedure is repeated until the last byte is acknowledged.

The printer deactivates the "DirReq" signal, sends the last byte to the bus and issues an ACK pulse. As soon as this byte is fetched by the computer, it issues a STROBE pulse to acknowledge the reception.

The printer switches its bus driver to reception mode, enables the interface by deactivating the BUSY signal and issues a ACK pulse. The computer responds by switching its bus driver to transmission mode.

The data transfer from the printer to the computer is now completed.

Physical interfaces

The interface is designed for reception and transmission of data in 8-bit frames. The data transfer to the system is carried out automatically and is initiated by the printer. The data transfer is controlled by a software protocol at both the computer and the printer end.

The signals of the parallel interface are explained in detail in the two tables below.

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Name	Direction	Description
Strobe	to printer	Reception mode: With this signal, the computer indicates to the printer that a byte is on the bus. Transmission mode: The computer activates the signal to confirm a request by the printer.
BUSY	from printer	With this signal, the printer informs the computer that no data can be received. This might be the case, if the printer buffer is full, or if a message is to be sent from the printer.
ACK	from printer	Reception mode: The printer activates this signal after it has fetched the byte from the interface. Transmission mode: The printer activates this signal to inform the computer of changes at the interface.
Stat Req	from printer	Reception mode: always 0 Transmission mode: The printer activates this signal in order to initiate a message to the computer.
DirReq	from printer	Reception mode: always 0 Transmission mode: This signal indicates the direction to which the bus is to be switched.
DirCtrl	Internal printer signal	This signal switches the direction of the data bus (in printer).
Data	bidirectional	D0..D7

Table 3: Signals of parallel interface

Parallel interface pin assignment

Adapter: 36-pin Amphenol socket

Contact	Input/output	Signal/function
1	Input	DATA STROBE (N)
2	Bidirectional	DATA 1
3	Bidirectional	DATA 2
4	Bidirectional	DATA 3
5	Bidirectional	DATA 4
6	Bidirectional	DATA 5
7	Bidirectional	DATA 6
8	Bidirectional	DATA 7
9	Bidirectional	DATA 8
10	Output	ACK (N)
11	Output	BUSY
12	Output	END OF PAPER
13	Output	SELECT (HIGH, if ONLINE)
14	Input	AUTO FDN
15-17	-	NC
18	Output	VCC (max. 50mA)
19-27	-	SIGNAL GROUND
28	--	NC
29-30	--	SIGNAL GROUND
31	Input	RESET (N)
32	Output	FAULT (N)
33-35	--	NC
36	Input	SEL IN (not supported)

Table 4: Parallel interface adapter assignment

(N) = active LOW

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If the interface is operated in bidirectional mode, the "Select" signal is assigned the "DIR_REQ", while the "Fault" signal is assigned the "STAT_REQ" function.

The socket shown below is located at the housing of the printer.

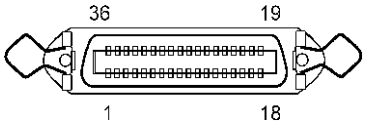

Fig. 13: Parallel interface adapter

Note

In order to ensure error-free data communication, only use shielded interface cables that are connected at both ends (computer and printer) to the chassis ground. Also ensure that all signal ground pins are correctly connected.

A.3.2. Serial interface

In serial communication, the bits of each byte are sent through the line one after the other, whereby the data flow is controlled by additional control lines.

Specifications

Baud rate:	2400, 4800, 9600, 19,200, 38,400 baud	
Word length:	Data frame:	7 bits or 8 bits
	Start bit:	1 bit
	Parity bit:	even, odd, no parity
	Stop bit:	1 bit or 2 bits
Synchronisation:	asynchronous	
Handshake:	READY/BUSY protocol (DTR protocol) ETX/ACK protocol XON/XOFF protocol	
Adapter:	EIA standard, 25-pin D-SUB, female plug	
Cable connection:	Shielded Beldon cable or similar, of max. 15 m in length; twisted-pair wires, to prevent communication errors.	
Signal level:	MARK polarity: -3 to –15V: LOW = OFF = logical "1"	
	SPACE polarity: +3 to +15V: HIGH = ON = logical "0"	

The interface parameters can be set in the printer menu of the configuration sofware. For more details, please refer to chapters A.4. and A.5.1.

In parity mode, the printer prints a question mark if it detects a parity error.

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Pin assignment and signals

Pin	Signal	Direction	Function
1	FG	-	Chassis ground - connected to the printer housing
2	TXD	from printer	data transmitted by the printer
3	RXD	to printer	data received by the printer
4	DTR	from printer	READY/BUSY, control signal for the control of the data traffic from the computer to the printer. The polarity can be selected in the printer menu.
5	CTS	to printer	Control signal for the control of the data traffic from the printer to the computer
6	DSR	to printer	indicates whether the system is ready for operation
7	SD	-	Signal GROUND
20		from printer	connected to pin 6 DSR

Table 5: Serial interface pin assignment

Protocols

READY/BUSY protocol

With the READY/BUSY protocol, the printer informs the computer by means of the voltage level at pin DTR (4) whether it is ready to receive data or whether the input buffer is full. The polarity of the BUSY line can be defined in the printer menu.

The signal is switched to BUSY, in the event of

- ... the printer buffer has reached its maximum capacity. The print buffer has an additional space for 16 more characters. Characters that are transmitted after the BUSY signal are accepted until the printer buffer is full.
- ... the end of the paper roll is reached or after an error has occurred.

XON/XOFF protocol

With the XON/XOFF protocol, the printer informs the computer by means of the control command XON (DC1) via line TXD (2) that it is ready for operation and can receive data.

With command XOFF (DC3), the printer indicates that its input buffer is full and no data can be received.

XON:	11_H	DC1
XOFF:	13_H	DC3

ETX / ACK auxiliary protocol

In addition to the above protocols, you have the option to run the ETX / ACK protocol to monitor function blocks.

If the comptuer sends an ETX signal after a function block has been transferred (e.g. one line of print), the printer confirms the processing of the function block with an ACK signal. If an error occurs in the processing of the function block, the printer returns an NAK signal.

ETX:	03_H
ACK:	06_H
NAK:	15_H

A.4. Configuration software

This chapter outlines the properties and available options of the configuration software.

A.4.1. Introduction

The configuration programme (PRT.EXE [German], PRTENG.EXE [English]) is a text-based utility that allows for direct access to the parallel interface.

It can be run on any "I386" PC with a DOS® operating system (MS-DOS®, PC DOS®, Caldera DOS®, Windows 95®, Windows® 98, etc.).

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A.4.2. Preparation

1. Please ensure that the BIOS settings for the parallel port are as follows:

☛ *EPP or standard bidirectional*

2. Also ensure that the parallel interface of your printer is activated (factory settings). If this is not the case, please follow the instructions in chapter 2.2.9.
3. Connect the parallel interface of the printer with the supplied cable to the parallel port of the computer.
4. Connect the printer to the socket and switch it on.
5. If there is paper in the printer (which is the case, if the printer is installed as supplied), it is now ready for operation and the LED is continuously on.
6. If there is no paper in the printer, please insert a roll as described in chapter 2.2.7.

☛ *If you wish to run the configuration software while there is no printer connected, please enter PRT.EXE x=1 in the command line. The configuration programme is now run in offline mode and does not require that a printer is connected.*

A.4.3. Starting the configuration programme

The configuration programme is included on the supplied installation CD in folder

<CD-ROM drive>:\tools\prt.exe

or

<CD-ROM drive>:\tools\prteng.exe

The software can be started in three different ways:

1. Run PRT.EXE or PRTENG.EXE directly from the command line of your operating system.
2. Boot your PC from a 3.5" startup disk, which can be created with BOOTDISC.EXE.
3. Boot your PC from the installation CD.

For methods 2 and 3, the BIOS settings of your PC might have to be adjusted. For detailed instructions, please refer to chapter 2.4.1.

Start the configuration program by selecting one of the above methods 1 to 3.

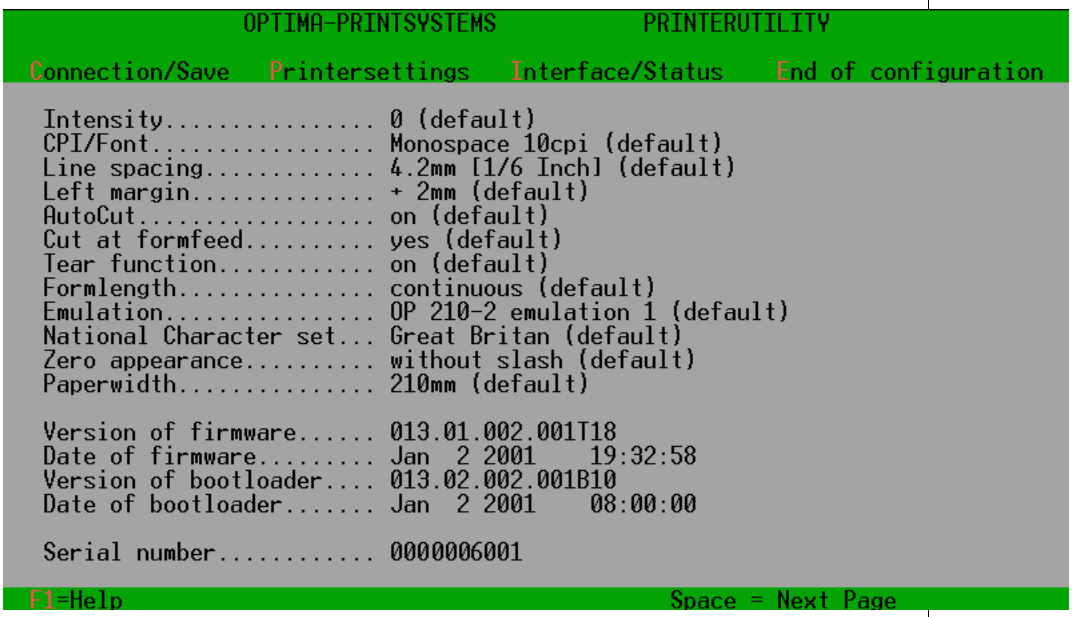
OPTIMA-PRINTSYSTEMS PRINTERUTILITY
Connection/Save Printersettings Interface/Status End of configuration
Intensity..... 0 (default)
CPI/Font..... Monospace 10cpi (default)
Line spacing..... 4.2mm [1/6 Inch] (default)
Left margin..... + 2mm (default)
AutoCut..... on (default)
Cut at formfeed..... yes (default)
Tear function..... on (default)
Formlength..... continuous (default)
Emulation..... OP 210-2 emulation 1 (default)
National Character set... Great Britan (default)
Zero appearance..... without slash (default)
Paperwidth..... 210mm (default)
Version of firmware..... 013.01.002.001T18
Date of firmware..... Jan 2 2001 19:32:58
Version of bootloader.... 013.02.002.001B10
Date of bootloader..... Jan 2 2001 08:00:00
Serial number..... 0000006001
F1=Help Space = Next Page

Fig. 14: Configuration software - parameters page 1

A programme screen with three distinct sections is displayed.

- The top section contains the available menu options.
- The centre section shows the settings of the printer parameters, the installed firmware versions and the serial number of the printer.

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- The bottom section includes the status bar and a reference to the help function.

To go to the second page, press the space bar.

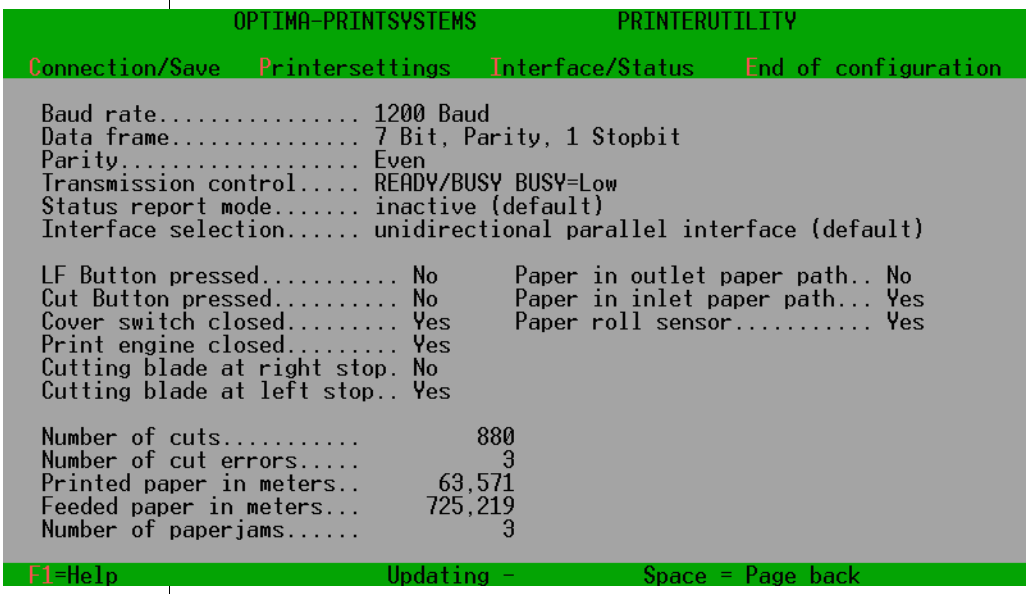
OPTIMA-PRINTSYSTEMS PRINTERUTILITY
Connection/Save Printersettings Interface/Status End of configuration
Baud rate..... 1200 Baud
Data frame..... 7 Bit, Parity, 1 Stopbit
Parity..... Even
Transmission control..... READY/BUSY BUSY=Low
Status report mode..... inactive (default)
Interface selection..... unidirectional parallel interface (default)
LF Button pressed..... No
Cut Button pressed..... No
Cover switch closed..... Yes
Print engine closed..... Yes
Cutting blade at right stop. No
Cutting blade at left stop.. Yes
Paper in outlet paper path.. No
Paper in inlet paper path... Yes
Paper roll sensor..... Yes
Number of cuts..... 880
Number of cut errors..... 3
Printed paper in meters.. 63,571
Feeded paper in meters... 725,219
Number of paperjams..... 3
F1=Help Updating - Space = Page back

Fig. 15: Configuration software - parameter page 2

This page shows the current settings for the interface parameters, the status of the internal printer switches and the already completed printing performance of your device.

☛ *This page is particularly helpful for the detection of errors.*

A.4.4. Manual operation

To change the settings of your printer, press the first (highlighted) letter of the respective menu on your keyboard. A window with all the relevant submenu options is displayed.

Press F1 to access the help for the selected menu item. Press ESC to close the help window.

The following overview lists all available menu options of the configuration program.

Menu Connection/Save

Connection for printer setup

Port	Device parameters of your parallel port
Interrupt	Device parameters of your parallel port

Printer test

Print file	Name of text file to be printed

Configuration file

Load	Loading of existing configuration file
Save	Creating a configuration file

Firmware

Flash	Loading of new firmware (file =XXXXXXXX.bin)

Caution

Do not load unreleased firmware or a file from a different source as this could lead to a complete failure of your printer.

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Print settings

Select the respective submenu by pressing the first (highlighted) letter on your keyboard.

A window showing the available values is displayed. Select the correct value by using the arrow keys and confirm your selection by pressing ENTER. To close the submenu, press ESC.

Continue with the next submenu item and proceed accordingly.

Intensity	See page 77
CPI/Font	See page 77
Line spacing	See page 77
Left margin	See page 78
AutoCut®	See page 78
Cut at formfeed	See page 78
Tear function	See page 78
Formlength	See page 78
Emulation	See page 78
National Character set	See page 79
Zero appearance	See page 79
Paperwidth	See page 80

Interface/status

Select the respective submenu by pressing the first (highlighted) letter on your keyboard.

A window showing the available values is displayed.

Select the correct value by using the arrow keys and confirm your selection by pressing ENTER.

To close the submenu, press ESC.

Proceed accordingly for all other submenu items.

Baud rate	See page 79
Data frame	See page 79
Parity	See page 79
Transmission control	See page 79
Status report mode	See page 79
Interface selection	See page 79

After you have completed all settings for your printer, close the programme by selecting menu option "End of configuration" and pressing the ESC key.

The system shows again the command line of your operating system. The selected parameters are now permanently saved in your printer.

A.4.5. Automated configuration

This option allows for the automated configuration and updating of your printer parameters.

In this chapter, you find the various command line parameters and return codes of the configuration programme. This information is intended for experienced system programmers and allows for the compilation of batch commands.

All available parameters and settings are listed and explained on the following pages.

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Printing parameters

A=0	0-1	AutoCut
B=1	0-12	Formlength
C=1	0-5	CPI
D=0	0-1	Zero appearance
E=0	0-1	Emulation
G=5	0-15	Intensity
N=3	0-14	National character set
P=0	0-1	Paperwidth
R=1	0-15	Left margin
S=0	0-1	Cut at formfeed
T=0	0-1	Tear function
Z=0	0-1	Line spacing

Parameters for printer interface

d=1	0-1	Status report mode
f=0	0-5	Data frame
m=0	0-2	Interface selection
o=0	0-1	Odd/even parity
r=4	0-5	Baud rate
u=0	0-2	Transmission control

The values of the printer parameters can be evaluated by saving an "ini" file in the menu mode.

Configuration programme start parameters

b=1	0-1	Batch mode
c=1C		Opt. initialisation control port
i=7	3-5,7	Interrupt
k=prt.ini		Configuration file
l=1	1-3	LPT number 1 to 3
p=378	0-FFD	Address of LPT port
t=3	1-20	Printer timeout in seconds
w=log.txt		Printer communication log file
x=1		No communication with printer (offline mode)
y=1		Send to printer only (only in conjunction with x=1 !)
z=3		0-32767 display status line and refresh rate in 1/18 s
/?		Help

Return codes in batch mode

0	No errors
1	No port at address
2	Port not in bidirectional mode
3	No interrupt
4	Printer in serial mode
5	Transmission aborted due to timeout
6	Reception aborted due to timeout
7	Incorrect reply header

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Sample configuration file

Example of a printer configuration file:

```
G#005
C#001
Z#000
R#001
A#000
S#000
T#000
B#001
E#000
N#003
D#000
m#000
r#004
f#000
o#000
u#000
d#001
P#000
```

Comment

The configuration programme must be run in conjunction with a OPTIMA 210-2 *or command line parameter x=1.*

If used together with third-party devices, the programme might crash.

A.5. Print control and menus

A.5.1. The printer menu

The printer menu allows for the configuration of the printer according to your specific needs. In this menu, you can for example select the interface to be used.

All available menu items are explained in this chapter. Menu items that can be accessed from the printer menu are marked with "printer menu". The other options are accessible through a special DOS-based configuration software which is described in detail in chapter A.4.

The modifications made in the menu are permanently stored in the printer and are not deleted when device has been switched off.

Please note when using the menu control

For these commands, the printer uses its internal data buffer for the generation of print data. New data may only be sent to the printer after the requested printout is been printed. Otherwise, there is a risk that all or part of the commands are included in the print file and that subsequent commands are thus made invalid.

The printer menu is designed as follows:

- At the top level, all functions are assigned to menu GROUPS.
- Within each group, there are several menu ITEMS.

Activating menu mode

To change the value of a menu item, activate the menu mode.

This is only possible, if the printer is switched off (LED off) and if the paper is properly inserted.

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To activate the menu mode, press the CUT button when switching on the printer and hold it until the following details are printed:

- Firmware version
- Bootloader version
- Serial number of printer

Subsequently, you are requested to select the language.

1. To select German, press the CUT button
2. To select English, press the LineFeed button

Adjusting menu settings

To access the next group and its menu items, press the CUT button.

To move to the next menu item within a group, press the LineFeed button.

After selecting the respective menu item, press the CUT button to move to the next group.

Saving menu

After all required changes to menu items have been made, press the CUT button until the modified menu is printed out (min. 2 seconds).

You have the option to decide whether the settings have to be saved, or whether you wish to return to the previous settings.

Saving menu:

- Press CUT button to save the settings. The printer is automatically restarted and loads the new menu settings.
- Press the LineFeed button to abort the procedure and to return to the previous menu values.

The menu configuration process is monitored by a timer (1 minute). If no button is pressed for a period of more than 1 minute, the process is aborted and the printer automatically returns to the previous settings and is again ready for normal operation.

General information regarding the behaviour of the interfaces

The printer supports communication with the computer through 2 different interface types (one direction only with unidirectional parallel interface). The active interface is configured by means of the printer menu. The not selected interface is thereby automatically deactivated (serial interface: RTS = inactive; parallel interface: ACKN, ERRORN and SELECT = 0, BUSY = 1).

A.5.2. Parameters

n1 Menu 1 Intensity

00_H = Level	-50%	
01_H = Level	-40%	
02_H = Level	-30%	
05_H = Level	0(normal)	(default)
06_H = Level	+10%	
07_H = Level	+20%	
$0E_H$ = Level	+90%	
$0F_H$ = Level	+100%	

n2 Menu 2 Fonts

00_H = Roman 7.8cpi	
01_H = Monospace 10cpi	(default)
02_H = Roman 12.5cpi	
03_H = Roman 15.5cpi	
04_H = Roman 17cpi	
05_H = Roman 20cpi	

n3 Menu 3 Line spacing

00_H = Line space 1/6 inch	(default)
01_H = Line space 1/8 inch	

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n4 Menu 4 Left margin

00_H = Print position left margin 0 + 0mm
01_H = Print position left margin 0 + 2mm (default)
02_H = Print position left margin 0 + 4mm
03_H = Print position left margin 0 + 6mm
04_H = Print position left margin 0 + 8mm
05_H = Print position left margin 0 + 10mm
06_H = Print position left margin 0 + 12mm
07_H = Print position left margin 0 + 14mm
08_H = Print position left margin 0 + 16mm
09_H = Print position left margin 0 + 18mm
$0A_H$ = Print position left margin 0 + 20mm
$0B_H$ = Print position left margin 0 + 22mm
$0C_H$ = Print position left margin 0 + 24mm
$0D_H$ = Print position left margin 0 + 26mm
$0E_H$ = Print position left margin 0 + 28mm
$0F_H$ = Print position left margin 0 + 30mm

n5 Menu 5 AutoCut®

00_H = AutoCut on (default)
01_H = AutoCut off

n6 Menu 6 Cut at formfeed

00_H = Form feed with cutting (default)
01_H = Form feed without cutting

n7 Menu 7 Tear function

00_H = Tear function on (default)
01_H = Tear function off

n8 Menu 8 Formlength

00_H = A4
01_H = Continuous form (default)
02_H = 1 inch
03_H = 2 inch
04_H = 3 inch
05_H = 4 inch
06_H = 5 inch
07_H = 6 inch
08_H = 7 inch
09_H = 8 inch
$0A_H$ = 9 inch
$0B_H$ = 10 inch
$0C_H$ = 11 inch

n9 Menu 9 reserved

n10 Menu 10 Emulation

00_H = OP 210-2 emulation 1 (default)
01_H = OP 210-2 emulation 2

n11 Menu 11 National Character set
00_H = Denmark 1
01_H = Denmark 2
02_H = Germany
03_H = United Kingdom
04_H = France
05_H = Sweden 1
06_H = Sweden 2
07_H = Sweden 3
08_H = Sweden 4
09_H = Netherlands 1
$0A_H$ = Netherlands 2
$0B_H$ = Japan
$0C_H$ = Norway
$0D_H$ = Latin America
$0E_H$ = USA (default)

n12 Menu 12 Command mode
00_H = Line emulation (default)

n13 Menu 13 Zero appearance
00_H = Zero without slash (default)
01_H = Zero with slash

n14 Menu 14 Interface selection (print menu)
00_H = Unidirectional parallel interface (default)
01_H = Serial interface (used in text mode)
02_H = 8-bit bidirectional parallel interface

n15 Menu 15 Baud rate (print menu)
00_H = 2,400 Baud
01_H = 4,800 Baud
02_H = 9,600 Baud
03_H = 19,200 Baud (default)
04_H = 38,400 Baud

n16 Menu 16 Data frame (print menu)
00_H = 8-bit, no parity, 1 stop bit (default)
01_H = 8-bit, no parity, 2 stop bits
02_H = 8-bit, parity, 1 stop bit
03_H = 7-bit, no parity, 2 stop bits
04_H = 7-bit, no parity, 1 stop bit
05_H = 7-bit, parity, 1 stop bit

n17 Menu 17 Parity (print menu)
00_H = odd (default)
01_H = even

n18 Menu 18 Transmission control (print menu)
00_H = READY / BUSY, BUSY = HIGH (default)
01_H = READY / BUSY, BUSY = LOW
02_H = XON/XOFF protocol

n19 Menu 19 Status report mode (print menu)
00_H = on
01_H = off (default)

A

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n20 Menu 20 Paperwidth
00_H = DIN (210mm) (default)
01_H = USA (215.9mm)

Note re. menu 10 - Emulation

OP 210-2 EMULATION 2 is a project-related subset of emulation 1, where all GS control sequences have been eliminated. For a more detailed list of the differences between the emulations, please refer to the command description.

Note re. menu 19 - Status report mode

This option is currently not supported by the printer. It will however in the future be integrated into the device and allows for the automatic output of error messages from the printer without request by the computer. This however means that the computer must be able to interpret such messages. This is currently not possible in Windows®.

Activating the interface parameters

With this command, the transferred configuration parameters for the serial interface are stored and activated by the printer. To enable communication by means of the transmitting programme, it must be switched over. We recommend to synchronise the sender and the recipient by means of a RESET (or power OFF/ON).

A.6. Processes

A.6.1. Initialisation of the printer

The printer is initialised every time the power supply is switched on or a RESET is completed. The following processes are completed:

- Resetting of all I/O lines and ports
- RAM test, loading of FPGA

- All connected modules such as the cutter unit, etc. are reset
- After completion of the initialisation, the printer is ready for operation.
- The ports are enabled.

  The READY indicator is on, as soon as the printer is ready for operation.

  If there is no paper in the printer, the LED is flashing. For error codes, please refer to chapter 4.2.1.

A.6.2. End of paper and paper jam

The end of the paper and a paper jam are detected by means of sensors.

End of paper 1:	Sensor near the paper roll. Printing is halted when only approx. 15 cm of paper are left.
End of paper:	Sensor located immediately in front of the printing module. The sensor prevents printing without paper.
Paper jam:	Sensor located behind the cutting unit. This sensor monitors the paper transport. In connection with the cutting unit control, it also monitors the removal of the cut paper end.

Procedure

The paper end sensor 1 is triggered, if there is only approx. 15 cm of paper left on the roll. The printer transmits a hardware status byte to the system, indicating that the end of the paper roll is nearly reached.

Printing is immediately halted and the printer switches to print stop. The READY indicator is flashing. The remaining paper is automatically removed to the out-tray.

After a new paper roll has been inserted, printing is resumed.

The printer is automatically switched to standard operation.

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Note

When replacing the paper, ensure that no paper is left in the output slot of the printer, as the new paper will otherwise not be detected.

Special measures in the event of torn paper

After a paper jam, all printed paper must be removed. For this purpose, the print engine must be opened. After the print engine is closed, the new paper must be inserted into the engine and the remaining lines are printed. The paper is thereby not transported to the tear position. In this case, press the LineFeed button to advance the paper to the tear position where it is cut.

A.6.3. Special functions

The printer provides 2 product-specific functions that can be enabled in the printer menu.

Automatic cutting (AutoCut®)

The printed paper is automatically cut, provided that the following applies in character print mode:

- 3 times Line Feed and 4 times character "N" at positions 1 to 4
- one space at position 5 and sequence of 4 numerals at positions 6 to 9 (NNNN 1234).

After the paper is cut, the printer retracts the paper to the 3rd print line of the next sheet.

Tear function

The instruction for the execution of the tear function (advance last print line to the visual edge, manual cutting by pressing the CUT button, subsequent retration of the paper to 3rd print line) is as follows:

- Character print mode and no reception of data at the interface for a period of 5 seconds.

A.7. Overview of commands

The overview below lists the main control sequences and the respective chapters where you find detailed descriptions of the relevant features.

Print modes (Page 86 ff.)

Function	Dec	Hex	ASCII
Horizontal character spacing	27 87 n	1B 57 n	ESC W n
Start horizontal character spacing for one line	14	0E	SO
alternatively			
Start horizontal character spacing for one line	27 14	1B 0E	ESC SO
Stop horizontal character spacing before line end	20	14	DC4

Print styles (Page 87 ff.)

Function	Dec	Hex	ASCII
Underline on	27 45 49	1B 2D 31	ESC-1
Underline off	27 45 48	1B 2D 30	ESC-0
Invert print on	30	1E	RS
(not implemented)			
Invert print off	31	1F	US
(not implemented)			

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Multifunction command (Page 87 ff.)

Function	Dec	Hex	ASCII
Combined print modes on Invert print, spaced print, underline	27 33 n	1B 21 n	ESC ! n

Page formatting (Page 88 ff.)

Function	Dec	Hex	ASCII
Set page length in lines	27 67 n	1B 43 n	ESC C n
Set page length in inches	27 67 0	1B 43 00	ESC C NUL
Set page length in dot lines	27 67 255 n	1B 43 FF n	ESC C FF n
Set left margin	27 108	1B 6C n	ESC l n

Paper feed (Page 89 ff.)

Function	Dec	Hex	ASCII
Activate variable line spacing (n/216 inch)	27 51 n	1B 33 n	ESC 3 n
Line feed	10	0A	LF
Page feed	12	0C	FF
Variable line spacing (n/216 inch)	27 74 n	1B 4A n	ESC J n
Line feed with cutting	28 74 n	1C 4A n	FS J n

Character sets (Page 91 ff.)

Function	Dec	Hex	ASCII
Select national character set	27 82 n (emulation 1)	1B 52 n	ESC R n
	27 54 n (emulation 2)	1B 36 n	ESC 6 n

Line graphics (Page 92 ff.)

Function	Dec	Hex	ASCII
Send data for line graphics	(see command description)		
Set line graphics to left alignment	(see command description)		
Line graphics from current cursor position	(see command description)		
Stop line graphics	(see command description)		
Resolution in graphic mode	(see command description)		
Selection of graphic height	(see command description)		

Graphic printing in columns (Page 95 ff.)

Function	Dec	Hex	ASCII
Graphic printing in columns	(see command description)		

Other commands (Page 96 ff.)

Function	Dec	Hex	ASCII
Printer head return	13	0D	CR
Clear buffer	24	18	CAN
Initialise printer	27 64	1B 40	ESC @

Special commands (Page 97 ff.)

Function	Dec	Hex	ASCII
Setting of dot current density	(see command description)		
Adjusting dot current density	(see command description)		
Cutting			
Compression on/off	(see command description)		

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A.8. Detailed descriptions of the commands

The following chapters contain detailed descriptions of all control sequences and commands in the overview.

A.8.1. Print modes

Character spacing

Function	Dec	Hex	ASCII
Start horizontal character spacing	27 87 49	1B 57 31	ESC W 1
End horizontal character spacing	27 87 48	1B 57 30	ESC W 0
Start horizontal character spacing for one line	14 or 27 14	0E or 1B 0E	SO or ESC SO
Caution! This command is not activated in emulation 2.			
Stop horizontal character spacing before line end	20	14	DC4
Caution! This command is not activated in emulation 2.			

With this command, the characters are spaced out by 200% (double their standard width). Example: text with a current character width of 10 cpi is printed at 5 cpi, if horizontal character spacing is activated.

The command for character spacing for one line is particularly useful for titles and headings, as the function is automatically deactivated before the end of the line. To deactivate the character spacing command prior to the end of a line, command "DC4" or "ESC W 0" must be transmitted.

If the character spacing has been permanently activated with "ESC W1", it can only be deactivated with "ESC W 0" and not with "DC 4".

A.8.2. Printing styles

Underline

Function	Dec	Hex	ASCII
Underline on	27 45 49	1B 2D 31	ESC - 1
Underline off	27 45 48	1B 2D 30	ESC – 0

With this command, all printable characters including spaces are underlined. Graphics are not underlined.

Invert print

Function	Dec	Hex	ASCII
Invert print on	30	1E	RS
Invert print off	31	1F	US

(not implemented)

After output of control code "Invert print on", all following characters are printed in invert mode, until control code "Invert print off" is transmitted.

A.8.3. Multifunction commands

Combined print modes

Function	Dec	Hex	ASCII
Combined print modes on	27 33 n	1B 21 n	ESC ! n

Invert print (not implemented), character spacing, underline

Caution! This command is not activated in emulation 2.

This command allows for the combination of the various print functions in a single control sequence. Parameter "n" indicates how invert print, character spacing and underline are to be combined (see reference table below).

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Print function	Hexadecimal	Decimal
Invert print (not implemented)	08	8
Character spacing	20	32
Underline	80	128

A.8.4. Page formatting

Defining the page length

Function	Dec	Hex	ASCII
Set page length in lines	27 67 n n = 1 to 252	1B 43 n	ESC C n
Set page length in inches	27 67 0 n = 1 to 19	1B 43 00	ESC C NUL
Set page length in dot lines	27 67 255 n n1, n2 = 1 to 4000 (hex n1 = 01 n2 = 00 to n1 = A0 n2 = 0F) (n1 = lsb, n2 = msb) 1 dot line = 0.125 mm	1B 43 FF n	ESC C FF n

Select the page length, which will then be communicated to your printer. The maximum page length that can be selected by means of this command is 50 cm. As the actual length of pages where the length is defined in lines depends on the set line advance, the maximum selectable value is defined by parameter "n". For a standard advance of 1/6" , the max. value for n_{max} = 117.

When switching on the printer, the page length saved in the printer's menu (EEPROM) is applied. With the above command codes, you have the option to override these basic settings, whereby the data is however not saved in the internal EEPROM of the printer.

The current position is defined as the top edge of the page. Due to the design of the printer, only page lengths of more than 3 inches are actually useful, as the minimum page length is 3 inches (this applies in particular, if form-feed with cutting is selected).

Defining the page margins

Function	Dec	Hex	ASCII
Set left margin	27 108 n	1B 6C n	ESC l n

Parameter "n" defines the width of the left margin in characters. The actual width of the margin is thus dependent on the set character spacing. After the right margin has been set, its position is maintained also after the character spacing is changed.

For "n", values between 0 and 170 are permitted, depending on the selected character set.

After switching on the printer, the value saved in the printer menu is applied.

A.8.5. Paper feed

Line spacing in dot lines

Function	Dec	Hex	ASCII
Activate line spacing (n/203 inch)	27 51 n	1B 33 n	ESC 3 n

This control code defines the line spacing in n/203 inch for all subsequent feed commands. Values between 1 and 255 are permitted.

Values that are smaller than the character height of the actually activated character set result in a reverse paper transport in printed lines.

Line Feed

Function	Dec	Hex	ASCII
Line Feed	10	0A	LF

With the line feed command, the printer advances the paper by the set line distance before the next line is printed.

In line emulation, the command initiates printing.

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Form Feed

Function	Dec	Hex	ASCII
Form Feed	12	0C	FF

When a form feed command is transmitted, all data in the printer buffer is printed and the print position is moved forward to the top of the next page.

Variable Line Feed

Function	Dec	Hex	ASCII
Variable Line Feed (n/203 inch)	27 74 n	1B 4A n	ESC J n

Caution! This command is not activated in emulation 2.

With this command, all data in the print buffer is printed and the print position is advanced by a distance defined by parameter "n" (n/203 inch). A minimum line feed that corresponds to the current character height is completed, irrespective of parameter value "n".

Value for n = 0 to 255.

Line Feed with cutting

Function	Dec	Hex	ASCII
Line Feed with cutting	28 74 n	1C 4A n	28 74 n

At n = 0, the data in the print buffer is printed and the paper is subsequently transported to the cutting position. After the paper has been cut, it is advanced to the position of the first print line of the next page, whereby the height of any set page header is taken into account.

Value for n = 0.

A.8.6. Selection of character set

Character sets

Function	Dec	Hex	ASCII
Select national character set	27 82 n (emulation 1)	1B 52 n	ESC R n
	27 54 n (emulation 2)	1b 36 n	ESC 6 n

With this command, you have the option to access the special characters of a specific national character set within decimal 32 to 127 (ASCII standard range). To activate one of these character sets, parameter "n" must be set to a value according to the table below.

After switching on the printer or after a reset, the value set in the printer menu (EEPROM) applies (see also A.9. Charactersets).

National character sets

00_H = Denmark 1
01_H = Denmark 2
02_H = Germany
03_H = United Kingdom
04_H = France
05_H = Sweden 1
06_H = Sweden 2
07_H = Sweden 3
08_H = Sweden 4
09_H = Netherlands 1
$0A_H$ = Netherlands 2
$0B_H$ = Japan
$0C_H$ = Norway
$0D_H$ = Latin America
$0E_H$ = USA

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A.8.7. Graphic printing in line print mode

Graphic data for line graphics

Dec	Hex	ASCII
27 42 111 n 87 Vx	1B 2A 6F n 57 Vx	ESC * o n W Vx

This control code transfers the line graphic data to the printer. The number of bytes is defined by "n" (whereby "n" is a sequence of between 1 and 3 numerical digits). "Vx" represents the actual graphic data.

In this mode, the graphic data is transmitted line by line, whereby the entire line width is divided into groups of 8 dots each.

For each group, the print data must be defined in a single byte (8 bits). The highest bit is thereby located to the very left in the dot group.

Line width for OP210-2: 1728 dots

Activating line graphic aligned to the left

Dec	Hex	ASCII
27 42 114 48 65	1B 2A 72 30 41	ESC * r 0 A

This command prepares the printer for the processing of a line graphic. It must be transmitted prior to the actual graphic data to ensure that this data is correctly interpreted as line graphic data. The graphic is aligned to the fixed left margin.

Line graphic at current cursor position

Dec	Hex	ASCII
27 42 114 49 65	1B 2a 72 31 41	ESC * r 1 A

This command prepares the printer for the processing of a line graphic at the current print position. It must be transmitted prior to the actual graphic data to ensure that this data is correctly interpreted as line graphic data.

End of line graphic printing

Dec	Hex	ASCII
27 42 114 66	1B 2A 72 42	ESC * r B

This control sequence indicates the end of the line graphic. The previously sent graphic data is printed. Data that is received after the above code is interpreted as ASCII codes or control commands.

Resolution in graphic mode

Dec	Hex	ASCII
27 42 116 n 82	1B 2A 74 n 52	ESC * t n R

The printer supports three different resolutions for line graphics. The resolutions apply in both horizontal and vertical direction. Available resolutions:

n	dpi	dot size (mm)
50	50	0.5 x 0.5
101	101	0.25 x 0.25
203	203	0.125 x 0.125

The resolution must be set prior to the printing of the line graphic.

Please note that "n" stands for a sequence of between 2 and 3 numerical digits.

Selection of graphic height

Function	Dec	Hex	ASCII
Selection of graphic height	28 118 n	1C 76 n	FS v n

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In line graphic mode, the graphic data is printed with a height of a multiple of "n", whereby "n" indicates the spacing factor in vertical direction (0 < n < 64). This command only applies to the graphic output and must thus be transmitted to the printer prior to the actual graphic data.

Example for line graphic (BASIC)

```
10   REM demo line graphic
11   width „lpt1:„,1000
12   open „lpt1:„ for output AS #1
13   print#1, chr$(10);          :REM linefeed
14   print#1,chr$(27);„*r0A„;    :REM line graphic
                                 :REM left aligned on
15   for k=1 to 10               :REM 10x3 bytes transmitted
16   read a,b,c
17   print#1,chr$(27);„*o2W„;    :REM data sequence for
                                 :REM Line Graphic
18   print#1,chr$(a);chr$(b);chr$(c);
19   next k
20   print#1,chr$(27);„*rB„;     :REM end of line graphic
21   print#1,chr$(12);           :REM form feed
22   close #1
23   end
24   data 255,130,128,128,134,194,128,142,226:REM line 1
                                              :REM to 3
25   data 128,158,246,128,190,254,255,190,254:REM line 4
                                              :REM to 6
26   data 255,158,246,255,142,226,255,134,194:REM line 7
                                              :REM to 9
27   data 255,130,128                         :REM Line 10
```

OUTPUT:

K	1st byte	2nd byte	3rd byte
1	■ ■ ■ ■ ■ ■ ■ ■	■ ■	■ ■
2	■ ■	■ ■ ■	■ ■ ■
3	■ ■	■ ■ ■ ■	■ ■ ■ ■
4	■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
5	■ ■	■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■
6	■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■
7	■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■
8	■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
9	■ ■ ■ ■ ■ ■ ■ ■	■ ■	■ ■
10	■ ■ ■ ■ ■ ■ ■ ■	■	■

Table 6: Graphic output

A.8.8. Graphic printing in column print mode

Graphic output in column print mode

Dec	Hex	ASCII
27 75 n1 n2 V1..Vx	1B 4B n1 n2 V1..Vx	ESC K n1 n2 V1..Vx

Caution! This command is not activated in emulation 2.

This mode allows for the printing of up to 1728 dots per line, provided that the entire thermal line width is available (i.e. no left and right margins). The printer ignores all graphic data that exceeds this limit.

Parameters "V1 .. Vx" represent the dot graphic data. After the correct volume of graphic data (defined in "n1", "n2") has been received, the printer returns to standard character mode.

The values "n1 " and "n2" define the number of horizontal column positions, whereby "n1" is the lower and "n2" is the higher significant (LSB+HSB) byte.

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Each byte consists of 8 bits (bit 0 to bit 7), whereby bit 7 contains the graphic data for the 1st print line and bit 0 contains the data for the last print line (line 8). As the standard character height corresponds to 24 lines, each graphic line is printed three times, allowing for aligned combinations of graphics and text.

A.8.9. Other commands

Print head return

Function	Dec	Hex	ASCII
Printer head return	13	0D	CR

This control command returns the printer head to the left margin as defined by the user.

Clearing of buffer

Function	Dec	Hex	ASCII
Clear buffer	24	18	CAN

With this command, you have the option to delete all text, with the exception of the control code.

Initialising printer

Function	Dec	Hex	ASCII
Initialise printer	27 64	1B 40	ESC @

With this code, the entire printer buffer is cleared, including data defining page forms. All configured character attributes are reset and character size selected in the menu is activated. The print cursor is set to the left print position as configured in the menu.

A.8.10. Special commands

Intensity

Function	Dec	Hex	ASCII
Change intensity	28 113 n	1C 71 n	FS q n

This control sequence allows for the adjustment of the thermal printer to suit different paper qualities.

By default, the intensity is set to n = 5, which is most suitable for the recommended paper products. A higher value might be selected for printing on thermally less sensitive paper or special paper and results in a lower output speed.

n (hex)	Current density	Level
0H	Lowest current density level	Level - 50%
5H	Default value	Standard level
6H		Level +10%
0FH	Highest current density level	Level +100%

Table 7: Current density

An increase of "n" by 1 corresponds to an increase of approx. 10%. These current settings are not overwritten when the printer is initialised by means of the control sequence ESC "@".

Please note that all parameters are hex values.

Automatic cutting (AutoCut®)

ASCII:	LF LF LF N N N N SPACE XXXX
Decimal:	10 10 10 78 78 78 78 32 XXXX
Hexadecimal:	0A 0A 0A 4E 4E 4E 4E 20 XXXX

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This command activates the automatic cutting function, provided that it is enabled in the menu (see chapter A.5.2.). After the paper is cut, the printer retracts the paper to the 3rd print line of the next sheet.

"xxxx" is a sequence of 4 numerical digits.

Compression

Function	Dec	Hex	ASCII
Compression on/off	28 75 n	1C 4B n	FS K n
	n= 0: data uncompressed n=1: data compressed		

This control sequence indicates whether the subsequent data is to be transmitted in a compressed format or uncompressed.

Compression of data

In order to reduce the volume of data for transmission, the data is encoded by means of the RLE (Run Length Encoding) method. This method combines adjacent bytes, if they have the same value. The sequence of characters is thus replaced by the actual character and a control character referred to as the multiply control character MCC.

The MMC preceeds the actual print data. To identify the MCC as a control character, the two higher bits are set in this byte. The MCC code is thus always greater than C0H. The lower 6 bits of the MCC indicate the factor with which the subsequent byte is to be mulitplied in order to obtain the original content of the data in uncompressed format.

This method allows for the transmittsion of a block of up to 63 bytes by means of only 2 bytes. If characters that are not encoded and that have a code higher than C0H are to be transmitted, an MCC must be sent prior these characters.

Example:

```
Original sequence
of characters:        F3 F3 F3 F3 F3 F3 F3 20 41 41 DO B8 B8

Compressed data:      C7 F3 20 C2 41 C1 DO C2 B8

------------------------------------------------------------

C7: MCC for F3

20: Unencoded byte (i.e. only included once)

C2: MCC for 41

C1: MCC for D0 (D0>C0 - would otherwise be interpreted as MCC
for multiplication of the subdquent byte with 16)

C2: MCC for B8
```

If blocks that are greater than 63 bytes are to be encoded, several blocks of 63 bytes each must be generated, whereby each block must be equipped with an MCC. The compression must be transmitted prior to the transfer of the control sequence for the activation of the graphic.

A.9. Character sets

The printer uses the IBM character set II, inlcuding the respective special national characters. The national character set is selected by means of the print menu or a control code.

The tables on the following pages show the base character set and the avaiablel national options.

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A.9.1. IBM character set II

Dez		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
	Hex	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0				0	➢3	P	➢8	p	Ç	É	á	•	•	•	a	•
1	1			!	1	A	Q	a	q	ü	æ	í	•	•	•	ß	±
2	2			„	2	B	R	b	r	é	Æ	ó	•	•	•	•	•
3	3			➢1	3	C	S	c	s	â	ô	ú	•	•	•	•	•
4	4			➢2	4	D	T	d	t	ä	ö	ñ	•	•	•	•	•
5	5			%	5	E	U	e	u	à	ò	Ñ	•	•	•	•	•
6	6			&	6	F	V	f	v	å	û	ª	•	•	•	µ	÷
7	7			'	7	G	W	g	w	ç	ù	º	•	•	•	•	•
8	8			(	8	H	X	h	x	ê	ÿ	¿	•	•	•	•	°
9	9			)	9	I	Y	i	y	ë	Ö	•	•	•	•	•	·
10	A			*	:	J	Z	j	z	è	Ü	•	•	•	•	•	·
11	B			+	;	K	➢4	k	➢9	ï	¢	½	•	•	•	•	v
12	C			,	<	L	➢5	l	➢10	î	£	¼	•	•	•	•	n
13	D			-	=	M	➢6	m	➢11	ì	¥	¡	•	•	•	Ø	²
14	E			.	>	N	➢7	n	➢12	Ä	•	«	•	•	•	•	•
15	F			/	?	O	_	o		Å	ƒ	»	•	•	•	•	

Fig. 16: IBM character set II

"➢1" to "➢12" indicate characters that are part of specific national character sets. These characters are explained in the next section.

A.9.2. Table of national character options

		ASCII-Codes (hex)											
n	Country	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
		➢1	➢2	➢3	➢4	➢5	➢6	➢7	➢8	➢9	➢10	➢11	➢12
0	Denmark 1	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
1	Denmark 2	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
2	Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	Great Britain	£	$	@	[	\	]	^	`	{	|	}	~
4	France	#	$	à	•	ç	§	^	`	é	ù	è	~
5	Sweden 1	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	Sweden 2	#	$	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
7	Sweden 3	§	$	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
8	Sweden 4	§	¤	É	Ä	Ö	Å	^	é	ä	ö	å	ü
9	The Netherlands 1	£	$	@	[	IJ	]	^	`	{	ij	}	~
10	The Netherlands 2	#	$	@	Æ	Ø	Å	•	`	æ	ø	å	~
11	Japan	#	$	@	[	¥	]	^	`	{	|	}	~
12	Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
13	Latin America	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	Ú
14	USA	#	$	@	[	\	]	^	`	{	|	}	~

Fig. 17: IBM character set II - national options

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